Cyperaceae in Natal

K.D. Gordon-Gray

STRELITZIA 2

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CYPERACEAE IN NATAL

by

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STRELITZIA

This is the second occasional publication of the National Botanical Institute to appear under the series name *Strelitzia*. The new series has replaced *Memoirs of the Botanical Survey of South Africa* and *Annals of Kirstenbosch Botanic Gardens* which the NBI inherited from its predecessor organizations.

The genus *Strelitzia* occurs naturally in eastern southern Africa. It comprises three arborescent species, known as wild bananas, and two acaulescent species, known as crane flowers or bird-of-paradise flowers. The logo of the National Botanical Institute is based on the striking inflorescence of *Strelitzia reginae*, a native of the Eastern Cape and KwaZulu/Natal that has become a garden favourite worldwide. It symbolizes the commitment of the National Botanical Institute to provide the facilities, knowledge and expertise necessary to ensure the conservation, sustained use, appreciation and enjoyment of South Africa's exceptionally rich flora and vegetation.

Cover: *Cyperus crassipes* Vahl, flowering plants in their natural habitat, Maputaland coast. Photograph: C.J. Ward.

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Abstract

Natal, the geographical area of South Africa covered in this work, is located between 27° and 31° south latitude and 29° and 33° east longitude. The topography is varied and mostly rugged, from sea level to exceeding 3 300 m, with a total land surface of approximately 91 000 km^2.

Genera and species of Cyperaceae (26 genera, 224 species), natural and introduced, are reported. Keys to the identification of these taxa are dichotomous in form and origin. The formal generic key is supplemented by a diagrammatic guide for users well acquainted with the floral morphology of the family. Alphabetical order of genera and species is followed in preference to a botanical sequence, as classificatory limits for the family are not stabilized. For each species, synonymy relevant to Africa and typification have been given; but these aspects are not complete and require additions and amendments. Original specific descriptions have not been attempted; instead reference is given to one (sometimes two) published circumscriptions that apply reasonably closely to Natal plants. Species affinities, distribution in Natal and ecological preferences are, in the main, the opinion of the author. Some genera, such as *Carex* and *Schoenoxiphium* were under revision by other workers at the time of completion of the manuscript. The treatments offered here are therefore no more than tentatively provisional. Notes on hybridisation and endemism are included, as is a provisional Hybrid catalogue.

Illustrations are by J.B.M. Browning, who received assistance with the scanning electron micrographs (SEM), from the staff of the Electron Microscope Unit of the University of Natal. Morphological features of the plant and dissections of its floral organs for one representative species (occasionally two) of each genus are reproduced in black and white. These are supplemented by SEM micrographs of achene surfaces.

Uittreksel

Natal, die geografiese gebied van Suid-Afrika wat in hierdie werk gedek word, is tussen 27° en 31° suiderbreedte en 29° en 33° oosterlengte geleë. Die topografie wissel en is meestal ru, vanaf seevlak tot meer 3 300 m, met 'n totale landoppervlakte van sowat 91 000 km^2.

Inheemse en uitheemse genusse en spesies van die Cyperaceae (26 genusse, 224 spesies) word behandel. Sleutels tot die identifikasie van hierdie taksons is digotomies in vorm en oorsprong. Die formele genussleutel word aangevul met 'n diagrammatiese gids vir gebruikers wat goed met die blommorfologie van die familie vertroud is. Alfabetiese, eerder as 'n taksonomiese volgorde word met genusse en spesies gevolg, aangesien die grense waarbinne die familie afgebaken word nog kan verander. Sinonimie wat betrekking het op Afrika en tipifikasie word vir elke spesie gegee; hierdie aspekte is egter nie volledig nie en byvoegings en veranderings is nodig. Daar is nie probeer om oorspronklike spesiebeskrywings te gee nie; in plaas daarvan word na een (soms twee) gepubliseerde omskrywing verwys wat redelik goed op Natal-plante van toepassing is. Spesieverwantskappe, verspreiding in Natal en ekologiese voorkeure is hoofsaaklik die mening van die skrywer. By voltooiing van die manuskrip was sommige genusse, soos *Carex* en *Schoenoxiphium*, onder hersiening deur ander werkers. Die behandelings wat hier aangebied word, is dus slegs voorlopig. Notas oor hibridisasie en endemisme, asook 'n voorlopige hibried-katalogus, word ingesluit.

Illustrasies is die werk van J.B.M. Browning, wat hulp met die aftaselektronmikrograwe van die personeel van die Elektronmikroskoopeenheid van die Universiteit van Natal ontvang het. Morfologiese kenmerke van die plant en disseksies van die blomdele van een verteenwoordigende spesie (soms twee) van elke genus word in swart-en-wit weergegee. Dit word aangevul met aftaselektronmikrograwe van dopvrug-oppervlakke.

Introduction

The geographical area

The new South African provinces defined in May 1994 have not been incorporated and, for purposes of this work, Natal is considered a geographical area without political division. Located between 27° and 31° south latitude and 29° and 33° east longitude, the land surface covers approximately 91 000 km^{2}, which is less than 8% of the total land surface south of the Cunene/ Limpopo Rivers.

There is an eastern coastline about 560 km in length, from a little south of Ouro Point (Mozambique) in the north, to the Mtamvuna River in the south; this coastline is warmed by the Agulhas Current.

The western boundary is formed by the Drakensberg Mountains that are part of the Great Escarpment at the eastern edge of the interior plateau of southern Africa.

The land rises rapidly from sea level to altitudes exceeding 3 300 m. It is markedly dissected by a number of steep river valleys, most importantly the valley of the Tugela River which meets the sea about midway between Stanger and Gingindhlovu, north of Durban.

In accordance with Ross (1972), the regions, Coastbelt, Midlands, Uplands, Zululand, N Natal, have been maintained so that plant distribution may be simply recorded. Maputaland more correctly replaces Tongaland, and the Kokstad region has been added to incorporate the area, now part of Natal, that was previously East Griqualand of the Cape Province (Figure 1).

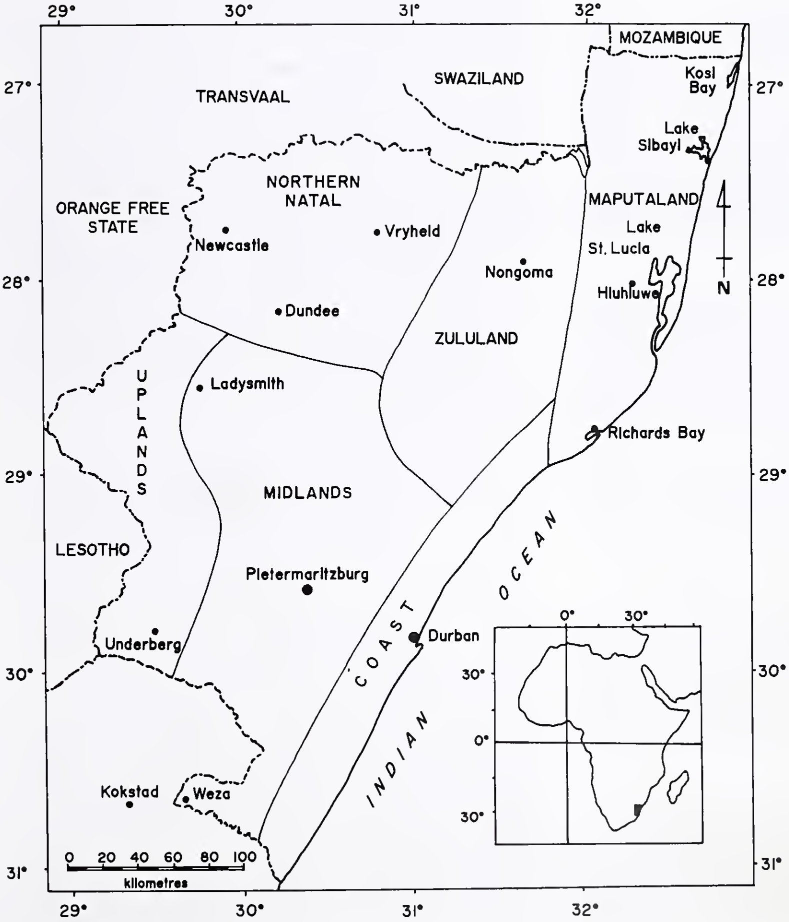


FIGURE 1.—Geographical area: main divisions.

The Coastbelt comprises coastal lowland and coastal hinterland. The lowland, with only two important embayments, Richard's Bay and Durban, has a coastline of rocky promontories with sand beaches between (into Maputaland the sand becomes more extensive). The hinterland (400–600 m) has some flat plateaux with cliffs making transition to the river valleys. Coastbelt vegetation is low dune scrub giving place to coastal forest with open grassveld on the plateaux.

The Midlands (in which the Kokstad region must be included) covers altitudes from roughly 600–1 400 m. The land is much broken by river valleys, most of them rugged and steep-sided. The rolling hills carry grassveld (now becoming much planted to exotic trees); the river valleys, dry thorn-scrub, and the south-facing escarpments, midland forest.

The Uplands (above 1 400 m) can be recognised as highlands (1 400–1 900 m) and mountains (1 900–3 300 m). The highlands are rolling plains covered in grassland with mountain forest on the steep south-facing slopes of kloofs and river valleys. The mountain vegetation is varied with temperate grassland giving place to fynbos and cliff vegetation. Hygrophilous and aquatic plants are frequent on the wet rock flushes, and in, and surrounding, the numerous small tarns. The summit plateau (mostly Lesotho country) carries afro-alpine scrub.

The northernmost region, Maputaland, is the southern extension of the Mozambique plain. Close to the seaboard, and characteristic of this area, are numerous lakes and lagoons (the Kosi lakes; Sibayi, a large freshwater lake, and the St Lucia system). Their development is the result of high dune formation behind the beaches. Inland are pans and marshes, including those of the Pongola River. This is the most tropical part of Natal. The vegetation is Sand Forest, Swamp Forest or grassland. Where estuarine conditions prevail there are mangroves.

A ridge of volcanic origin, running almost due north-south (highest altitude ± 600 m), the Lebombo Mountains, lies between Maputaland and the region designated 'Zululand'. This region has some individuality in its grass-covered hills and steep valleys, but it has affinity, particularly in its vegetation, with the Transvaal and Swaziland.

Northern Natal is predominantly grassland, but the northern (low) Drakensberg is forested. This region abuts on, and has alliance with, both the Orange Free State and the Transvaal.

The Kokstad region has been included as Midlands, but it is more southern than the main Midlands area. This is reflected in the vegetation, which includes species that, further north, are predominantly plants of the Uplands. There are also some taxa that are more characteristic of the Transkei and the eastern Cape, than of the Natal flora.

Objectives of this book

In Ross' *Flora of Natal* (1972), 22 genera and 169 species were listed within the family Cyperaceae. It was realised then that this was no more than a preliminary estimate of representation of the family in the Natal flora. Some genera, such as *Ficinia* Schrad. and *Schoenoxiphium* Nees, were so poorly known that species could not be named with precision, nor could their numbers be adequately estimated. It was essential that study be continued.

The present work, in which 26 genera and 224 species are recognised, is the outcome of this study over approximately two decades. It incorporates results obtained by many workers, not only Natal botanists, but others who have pursued investigation into the family for many reasons and in all parts of the world. This is not to suggest the work is comprehensive. Far indeed from this; but it is an attempt to co-ordinate what is known of Natal sedges in the context of the world sedge flora, and to provide keys to their specific identification (lacking before) by use of which the plants and their role in the ecology of the land, particularly in relation to provision of adequate water supplies for the future, may become more widely known and better understood.

Importance of the family

Members of Cyperaceae are essentially plants of wet habitats. Therefore they are components of the vegetation associated with estuarine, riverine, lacustrine, bog (vlei) and temporary moist areas. Some have accommodated to drier conditions and are present in grasslands competing with the grasses or colonising bare, exposed hillocks where they hold the soil and resist firing. Others, far less obvious, occupy shaded niches in the transition zone from woodland to grassland, or survive, mainly as annuals, in the thin, temporary moist soil overlying rock outcrops. There are also those that favour open forest glades as undergrowth plants; some of these persisting in man-made plantations of exotic tree species. A few are notorious weeds, 'water grass', *Cyperus esculentus* L., and 'red nutgrass', *C. rotundus* L., among the worst. Others have been brought into Natal presumably with crop seeds such as rice. These include *C. difformis*, which has become a menace in cultivation practices in many eastern countries.

Because of their habitat preferences, the sedges need to be better known. They hold significance in land use and management for they are indicator plants of the wetland areas only now beginning to receive the attention they so justly merit.

The economic importance of the grasses (Poaceae) has long been realised, and in Natal, where much of the country is grassland, they have been far better studied than have the sedges. Some sedges with long, straight flowering stems (culms) uninterrupted by leaves, are used in weaving by those of the indigenous peoples still dependent on natural resources for the necessities of life. A few are utilised in paper-making, but on a minor scale. Some coastal species of *Cyperus*, particularly *C. dives* Delile [= *C. immensus* C.B. Clarke], are natural hosts to the indigenous moth, *Eldana saccharina* Walker. The larvae of this insect that, under certain conditions, will adopt *Saccharum* cultivars (sugar cane) as alternative hosts, have posed some threat to the Natal sugar industry. Apart from these minor aspects, the sedges are said to have no economic importance and thus have been ignored, apart from their academic interest which is considerable. In reality, their role is a significant, greatly understated one. They provide food for many indigenous animals, hippopotamus the most spectacular, others far more humble and often unnoticed. Far more significant than as a food source, is the importance of these plants in their natural environments. Their ecological role has so far gone unproclaimed and underdocumented. It should be studied.

Evolutionarily, Cyperaceae appear to be an old established group among the flowering plants. Extant genera, such as *Carex*, produce fruits differing hardly at all from remains identified from Tertiary strata of ages somewhere between 70–30 million years before present time. Many Natal species have pantropical and frequently pluricontinental distributions. This also, as far as is known, is indicative of age. In the restricted phytogeographical work that has so far been achieved for sub-Saharan Africa, the sedges, largely because of ignorance concerning them, have been almost totally omitted. The widespread species have, in course of their history, had many names applied in differing parts of their ranges. It is important that in southern Africa, nomenclature and classification be brought up to date to keep knowledge in accord with advances being achieved world-wide. Only in this way will the evidence southern African sedges are able to contribute to global scientific investigations, such as vegetational and climatic change and continental movement, be revealed.

The sedges have a physiology in which passively or actively, as the case may be, there is gradual accumulation in the plant body of compounds of silicon. This mineral, so prevalent in soils, goes into the soil water by way of gradual solution of its compounds. This soil water is taken up by the plant, which, by transpiration, loses it again. The silicon compounds are deposited in the plant cells, often particularly epidermal cells, as plates on cell walls, nodules and so on. The shapes taken by the ‘silica bodies’ formed are characteristic of Cyperaceae. With decay of the plant body, the silica deposits reach the soil once more, where they persist and are recognisable as of sedge origin, until dissolution changes their appearance. Occasionally silica bodies are constituents of aeolian sands and may provide some evidence of geological significance.

Much more importantly, the silica bodies of the epidermal cells, particularly those of the achene pericarp, are useful now in the identification of species and, to some extent, genera, thanks to facilities provided by the technology of Scanning Electron Microscopy.

The sedges with sub-Saharan African distribution, which form a relatively high percentage of the total species represented, are reaching the southeastern limits of their continental distribution in the Natal geographical area. Scientifically it is interesting to observe their generally smaller stature, more contracted inflorescence branching and, very often, greater development of leaf blades, compared with their tropical counterparts. Such change as occurs is not sudden, but in gradual accord with increasing latitude and more temperate climatic conditions. It stands to reason that zones are not clearly defined, altitude and microhabitat both being significant in disturbing patterns, especially where landscape is dissected.

Classification

Classification within Cyperaceae is by no means stable, nor accepted by specialists without some level of disagreement. The past two decades have witnessed changes. This is so particularly in the breakdown of genera, *Scirpus* L. being the outstanding example. But there has been merging also, for example evidence is growing that *Mariscus* Vahl is an integral part of *Cyperus* L. There have been changes too in the understanding of relationships among genera; for example *Isolepis* R. Br., segregated from *Scirpus sensu lato*, is now thought to have close affinity with *Cyperus*.

Progress is slow because information derived across a wide front of investigation and relating to world taxa is required if changes are to be securely based.

In the present work a conservative approach has been adopted. For convenience, *Mariscus* has not been incorporated into *Cyperus*, but *Juncellus* C.B. Clarke has. *Pycreus* P. Beauv. and *Kyllinga* Rottb. have been maintained. *Scirpus* L. has been partially broken down into the segregates *Schoenoplectus* (Rchb.) Palla, *Bolboschoenus* (Asch.) Palla, *Isolepis* and *Oxycaryum* Nees, but a small residue of *Scirpus* species remains unplaced. Some of these species possess characteristics linking them with *Scirpoides* Ség., but this relationship must be further explored.

Abildgaardia Vahl, *Fimbristylis* Vahl and *Bulbostylis* Kunth ex C.B. Clarke have been accepted in agreement with the views expressed by Goetghebeur & Coudijzer (1984). *Costularia* C.B. Clarke has been absorbed into *Tetraria* P. Beauv., but the need for revision of this predominantly Cape genus is clear.

As far as possible, for the sake of uniformity, the classifications adopted by Dyer (1976) and Reid (1985) have been adhered to.

Plan of the work

Two keys have been provided by which genera may be identified. Because of the heterogeneous residue of species still maintained under *Scirpus*, identification at generic level is rendered difficult, making the orthodox key long. For those already familiar with the structural features of Cyperaceae, a second key that should be used in conjunction with the illustrations of representative species for each genus, is given. This will serve to narrow possibilities quite rapidly, but is no more than a guide.

Detailed original descriptions have not been given, but reference has been made to one (sometimes two) descriptions that apply reasonably closely to the Natal plants, bearing in mind that dimensions given are never absolute, but merely a good indication. In the same way, under ‘Icones’, illustrations that might be of assistance have been listed. These again should not be taken as absolute.

Alphabetical order of genera and species has been followed rather than the botanical classificatory sequence that is still undergoing change and may differ from specialist to specialist. The general pattern followed is that stipulated for *Memoirs of the Botanical Survey of South Africa*. Synonyms are incomplete, as is the typification. Both need additions and refinement. Cited specimens are housed in the Herbarium, University of Natal (NU), unless otherwise stated. Generic numbers are based on the system of De Dalla Torre & Harms (*Genera Siphonogamarum*, 1900–1907) as modified in Arnold & De Wet (1993). The species keys and comments upon species, their affinities, distribution and ecological preferences in Natal, are original.

Illustrations

To aid in identification, an illustration of the main morphological characteristics of one species of each genus, has been included. In many genera consideration of a single species in no way covers the range of form represented within all Natal representatives; it is rather only a general guide. Among the most reliable features of morphological form are characteristics of the surfaces of achenes, preferably those matured on the plant itself growing under natural conditions. Thanks to modern technology, it has become possible to use detail of achene surface topography in routine identification. It is to this end that the scanning electron micrographs are included.

Not every species has its fruit represented in these micrographs. Some genera, like *Mariscus*, exhibit relatively uniform sculpturing of achenes as compared with others like *Ficinia* and *Isolepis* where interspecific differences are much more marked. This has been taken into account. Other factors have also mitigated against the inclusion of micrographs of every species. In some few cases, mature achenes were not available; in others most were imperfect, either because of infertility, or fungal, or insect attack.

Where achenes are normally shed within glumes, and where glume structure itself may be significant, as in *Kyllinga*, these organs may have been included in the illustrations. Where achenes are enclosed, as in *Schoenoxiphium* and *Carex*, the utricles, where not too large, or too featureless, have been pictured. In other genera, like *Eleocharis* and *Bulbostylis*, where style bases are persistent, the general shape of these bases is depicted. In *Fuirena* an attempt has been made to include bristles and scales. For almost every species two micrographs are given: the first, at lower magnification, portrays general achene shape and surface texture; the second, at higher magnification, gives detail of the outer pericarp topography. In using the last-named micrographs in identification, caution is necessary. It is important to bear in mind that, even if what appear to be mature achenes have been scanned, variability is possible.

The pericarp surface depicted gives the outline of the cells of the epidermal layer, supported, or not, by upgrowths of silicious material deposited within these cells. The extent of the silicious material increases gradually during the life of the cell. Eventually, after death of the protoplast, there is drying out and often subsequent breaking away of the outermost periclinal wall with direct exposure of the silicious deposits.

The topography visible in the micrographs depends, at least to some extent, on the age and the conditions of drying of the achene prior to its preparation for scanning. If the epidermal cells are intact, the topography will not be identical with that in examples where the exterior walls have ruptured. Again, if the achene was subjected to rapid, artificial drying before having reached full maturity under natural conditions (as in herbarium specimens), other differences in topography are possible. In order to minimise variability, and to avoid surface detritus, some workers specially treat the achenes before scanning in order to remove the outermost walls of the epidermal pericarp cells so that the topography of the silicious contents are markedly clarified (Schuyler 1971b; Goetghebeur & Van den Borre 1989).

Workers attempting identification should compare the micrographs against achenes taken at random from their material and observed under binocular dissecting microscopes. When specialised techniques are used in preparation of the achenes, the form and clarity of the silica bodies may be overstated in relation to what is seen under much lower magnification, thus making comparisons less trustworthy.

Hybridization

Natal is a relatively small geographic area; but its topography is diverse and dissected with a multiplicity of microhabitats and therefore environmental niches. When such an area supports plants capable of gene exchange across infraspecific, specific, or supraspecific taxonomic limits (hybridisation), and when the plants are perennials able to propagate by vegetative multiplication to permit stabilisation of the breeding system, then the main conditions for the establishment, propagation and perpetuation of new genotypes from spontaneous natural hybrids (hybrid speciation) are satisfied.

In America (Drury 1956; Smith 1969) and the British Isles (Stace 1975), hybrids have been reported within Cyperaceae. Similar records within Juncaceae are not uncommon (Stace 1975). These two families, now considered closely related, possess several unusual and distinctive cytological and embryological features. These include polycentric chromosomes, that is with diffuse not localised centromeres. Correlated with this condition occur aneuploidy (agmatoploidy, namely differences in the number of independently assorting chromosome fragments in a group of organisms) and postreductional meiosis (failure of the paired chromosomes to disjoin in the first meiotic division, separation taking place only in the second division). In addition, an unusual mode of pollen formation may occur. In Cyperaceae, a tetrad of microspores produces only one functional pollen grain; in Juncaceae a tetrad produces four grains, but these adhere. The role played by these peculiarities, especially agmatoploidy, in plant speciation is still unclear (Löve *et al.* 1957; Grant 1971).

In the two families, the phenomena mentioned are not all equally represented in all genera. In Cyperaceae, for example, polycentric chromosomes are known in *Scirpus* L. *sensu lato, Carex* L. and *Eleocharis* R. Br.; *Bulbostylis* Kunth ex C.B. Clarke and *Cyperus* L. include both types; *Fimbristylis* Vahl has localised centromeres only. In *Fimbristylis* the species fall into an even, or nearly so, polyploid series; in *Carex* aneuploidy (agmatoploidy) is extensive; in *Eleocharis* much less.

In Natal, apart from the work of Baijnath (1973, 1976) who recognised a hybrid species within *Cyperus* (chromosome number 2n = 14) and Frankish (1960) who recorded 2n = 10 for each of six allopatric populations of *Fimbristylis complanata* (Retz.) Vahl, nothing whatever has been recorded of hybrid speciation, or of chromosomes, or other cytological features.

In getting to know the Natal representatives of Cyperaceae over some forty odd years of association with them, evidence has accumulated that now prompts the expression of certain hypotheses regarding natural hybridisation and hybrid speciation. These ideas are no more than supposition based on observation and deduction; they entirely lack experimental proof. Nevertheless, they need to be recorded so as to stand the test of the observations and opinions of others, and with hope, eventual experimental testing.

It is apparent that natural hybridisation and hybrid speciation are operative but the genera are by no means uniform in the evidence they provide in relation to these phenomena. (Is it possible these differences correlate with inherent cytological differences?) The nature of the evidence is not necessarily comparable among genera. There may be different 'stages' operative within different genera.

In the Hybrid catalogue, cases of suspected hybridisation and hybrid speciation are listed. This has been done alphabetically by genus, omitting those genera presently under study by other workers. The pattern followed is more or less that adopted by Stace (1975).

Endemism

Again, Natal is hardly sufficiently extensive geographically to permit viable consideration of endemism within Cyperaceae. There are no endemic genera. All are known in other parts of Africa; many are pluricontinental. *Ficinia* Schrad. and *Schoenoxiphium* Nees are probably the most restricted distributionally. The residue of *Scirpus* species needs investigation to discover precise alliances.

If the limits of Natal be extended to include limited areas immediately adjacent, then there are a few endemic species. These are:

Bulbostylis parvinux C.B. Clarke (also southern Mozambique)

Carex monotropa Nelmes (also Lesotho)

Carpha filifolia Cl. Reid & T.H. Arnold (restricted to sandstone and basalt formations of the Upper Karoo system in the Drakensberg; recorded from localities that fall into Lesotho, the Orange Free State and the Transvaal, as well as Natal)

Cyperus schlechteri C.B. Clarke (also Lesotho)

C. sensilis Baijnath

C. × *turbatus* Baijnath

Fimbristylis dregeana Kunth (also Transkei: total limits uncertain)

F. variegata Gordon-Gray (also Transkei)

Isolepis pellocolea B.L. Burtt (also Lesotho)

Scleria natalensis C.B. Clarke (also Transkei)

S. sobolifer E.F. Franklin (also Transkei)

S. transvaalensis E.F. Franklin (also Transvaal and Swaziland)

This list may be increased by species of *Schoenoxiphium* Nees when revision of the genus is completed. A few other species, including *Isolepis angelica* B.L. Burtt, *Ficinia filiculmea* B.L. Burtt and *Scirpus falsus* C.B. Clarke need further investigation.

Glossary

abaxial: the side of an organ away from the axis.

achene: a small, dry, indehiscent, one-seeded fruit with tight, thin pericarp.

acuminate: an acute, protracted prolongation with somewhat concave sides.

adaxial: the side of an organ towards the axis.

adventive: a non-indigenous taxon that is established in a new region but is not expanding its range (compare naturalized).

agamic complex: a group of hybrid plants reproducing wholly or partially by unfertilized seeds.

agmatoploidy: a specialisation of aneuploidy; differences in the number of independently assorting pairs of chromosome fragments in a group of organisms.

allopatric species: species whose geographical ranges do not overlap (see also **sympatric**).

allopatry: the state of having different geographical ranges (see also **sympatry**).

amphicarpy: possessing two kinds of fruit differing in character and time of ripening (Browning 1992a).

androgynous: having male and female flowers in the same inflorescence.

aneuploidy: the existence of more (or less) than the basic chromosome number in a normal plant, which is not an exact multiple of the basic number.

anthela: the cymose inflorescence type of many Cyperaceae [a supradecompound umbel or corymb modified by the uppermost branch being reduced in length and by the number of spikelets borne upon it: term proposed by (Meyer 1819) see Rickett (1944)].

anticlinal: perpendicular to the surface (applied to cell walls).

antrorse: directed upwards (opposite: **retrorse**).

apiculate: terminated by an apiculum.

apiculum: a short, sharp, flexible point.

apomixis: reproduction in which sexual organs or related structures take part, but fertilization does not occur, so that the resulting seed is vegetatively produced.

arista: a stiff, bristle-like, elongated apex (awn).

aristate: possessing an arista.

attenuate: showing a long gradual taper, applied to the bases or apices of parts.

axis: main or central line of development of any plant or organ, particularly the main stem.

bract: a modified leaf, associated with the inflorescence or its parts; often much reduced, sometimes to a scale.

bristles: stiff hairs, or slender more flexuous bodies inserted on the receptacle below the floret; often in two ranks (see **hypogynium/perianth bristles**).

caespitose: tufted; growing in tufts or patches.

cancellate: latticed.

capitate: resembling a head.

cauline (leaves): belonging to the stem or arising from it.

cleistogamous: fertilized within the unopened flower.

clonal complex: a group of hybrid plants reproducing by vegetative propagules rather than by agamospermous seeds.

cormose: with the nature of a corm; applied to the solid, swollen base of a stem.

culm: the aerial stem in sedges and grasses.

cyme: a broad, more or less flat-topped, determinate flower cluster, with central flowers opening first.

cymose: with the construction of a cyme.

decumbent: prostrate, with the tip ascending.

dentate: toothed; the teeth usually rather coarse and perpendicular to the margin.

depauperate: impoverished as if starved; reduced in form and/or function.

digitate (of spikelets): radiating like the fingers of a hand with the members arising from the same point and terminating the inflorescence branch (see **spicate**).

digyny: with 2 separate styles or style branches.

distal: further (remote) from the point of attachment (opposite: **proximal**).

distichous: two-ranked, on opposite sides of the axis and in the same plane.

ecotone: area with vegetation transitional between two or more different plant associations.

ecotype: a group of populations that share certain physiological and genetic characteristics that make them better adapted to the ecological conditions of an area than other populations of the species.

eligulate: lacking a ligule.

emarginate: shallowly notched (cut out) at the apex.

endemic: native to, or confined naturally, to a particular and usually restricted area or region.

ensiform: sword-shaped.

etuberculate: lacking tubercles.

excurrent: running out beyond: usually applied to the midrib extending beyond the apex of the leaf or glume.

facies: the general morphological appearance of an object or organism.

filiform: thread-like; long and very slender.

fimbriate: fringed.

flexuous: zig-zag or wavy; bent alternately in opposite directions.

floret: a small, individual flower.

foliaceous: leaf-like in texture, shape, or both.

glabrous: lacking hairs (opposite: **pubescent**).

glaucous: covered with a bloom or whitish substance that tends to rub off; often modifying the natural colour.

globose: spherical; round like a ball or sphere; (opposite: **orbicular**).

glomerate: arranged in a dense or compact cluster or clusters.

glomerule: a small, condensed cyme of almost sessile flowers; a small, compact cluster.

glumaceous: glume-like.

glume: a scale-like bract: described as a fertile glume when it subtends a floret; a sterile glume is empty or does not subtend a functional floret.

glycophytic: receiving moisture from fresh water (compare **halophytic**).

gynophore: the portion of the receptacle supporting the gynoecium (well developed in *Ficinia* and *Scleria*).

halophytic: tolerant of various mineral salts (usually sodium chloride) in the soil and soil water (compare **glycophytic**).

haploid: the organism with the single number of chromosomes.

herbaceous: an adjective applied to non-woody tissues, usually chlorophyllous, or non-woody plants.

hispid: with rough hairs or bristles.

hypogynium: portion of the receptacle below the ovary.

hypogynous bristles: bristles arising from the hypogynium.

imbricate: overlapping.

indumentum: any covering, as for example, fairly dense hairiness.

inflorescence: flower-bearing part of the plant; the flowers themselves considered collectively with their supports.

karyotype: the chromosomal complex characteristic of a group of allied plants; associated with both chromosome morphology and chromosome number.

lacerated: torn at the edges or irregularly cleft.

lanceolate: a shape broadest below the middle with length to breadth ratio about 3:1 (up to the time of De Candolle this term was used for narrowly elliptic, that is broadest about the middle with length to breadth 3:1).

leaf blade: (**leaf lamina**) the expanded part of the leaf.

leaf sheath: the lower part of the leaf surrounding the shoot or culm.

ligule: the thin membranous or hairy outgrowth at the top of the leaf sheath in grasses and sedges.

linear: narrow, the sides parallel or nearly so, the length : breadth ratio 3:1–6:1, but frequently applied to grass and sedge leaf blades that are much longer in relation to their breadth (more correctly **ensiform**: sword-shaped).

lineolate: marked with fine or obscure parallel lines.

morphology: the study of the form of plants.

mucro: a short, straight point.

mucronate: with a mucro; terminated abruptly by a distinct short point.

naturalized: a non-indigenous taxon that forms self-sustaining populations in its area of introduction and which is capable of increasing its range (see **adventive**).

obovate: inverted ovate; broadest above the middle and narrower towards the base, ratio length : breadth about 3:2 (a flat or outline shape, see **ovate**).

obpyriform: inversely pear-shaped.

obsolete: rudimentary, suppressed, hardly apparent.

orbicular: circular in outline, disc-shaped (see in contrast, **globose**).

ovate: the outline of a hen's egg, broadest below the middle and narrow towards the apex, length : breadth ratio 2:1–3:2 (a flat or outline shape, see **obovate**).

overtopping bract: the bract extending beyond the inflorescence usually in the line of the culm and resembling the culm.

panicle (paniculate): an inflorescence with branches from successive nodes of the main axis (a compound raceme).

pantropical: throughout the tropics.

papillose (**papillate**): covered with papillae (strictly: papillate, having papillae; papillose, covered with papillae).

papilla: soft, nipple-like superficial gland or protuberance.

patent: spreading; diverging from the axis at almost 90°.

pedicelled: with a flower-stalk or pedicel.

peduncle: the specialised uppermost part of a culm bearing an inflorescence; the stalk of a cluster of spikelets.

perianth bristles: structures thought to be derived from a perianth by reduction (see **hypogynous bristles** or **bristles**).

perigynium: interpreted morphologically as a modified tubular prophyll.

phenotype: the physical appearance of an organism; the phenotype results from the interaction between the genetic constitution (genotype) of the organism and its environment.

phylogeny: the evolutionary history of a population, species, or higher category.

pilose: with distinct, long, ascending hairs.

planoconvex: more or less flat on the inner (**adaxial**) side, rounded on the opposite (**abaxial**) side.

podium: a foot-stalk or similar support.

polymorphic: the existence of more than one form of the same organ on a plant; the simultaneous occurrence of several discontinuous phenotypes in a population.

polyploidy: a chromosome complement of three or more sets of chromosomes, each set with the exact haploid number.

praemorse: with irregular and abrupt termination, as if the end were bitten off (see Figure 81 D).

prophyll: literally 'first leaf'; the first scale on any shoot, set adaxially and usually 2-keeled (seldom absent in monocotyledons; unknown in dicotyledons).

proximal: at the near, inner, or attached end (opposite: **distal**).

pseudospike: a false spike; an inflorescence that appears spike-like, but with the spikelets pedicelled, not sessile.

puberulous: (**puberulent**) downy with very short soft hairs.

pubescent: covered with short soft hairs; (opposite: **glabrous**).

punctate: marked with dots, spots, minute glands.

punctiform: dot-like, reduced to a mere point.

pyriform: pear-shaped.

raceme: a simple, elongated, indeterminate inflorescence bearing stalked flowers.

rachilla (rhachilla): a diminutive axis; in particular in the sedges, the axis of the spikelet that bears the florets.

radioli: the ultimate branches (rays) of a compound inflorescence that bear the spikelets (the term used especially in conjunction with large anthelate inflorescences in *Cyperus*).

reticulate: netted.

retrorse: pointing downward or backward (opposite: **antrorse**)

ruderal: growing in waste places.

scabrid: (**scabrous**) rough to touch, with minute teeth or scattered, short, stiff, broad-based hairs.

scale: any thin scarious body, often only vestigial.

scale leaves: modified reduced leaves, usually on underground shoots, but sometimes on above-ground portions.

scarious: applied to leaf-like parts or bracts that are not green, but thin, dry, and membranaceous, often more or less translucent (opposite: **herbaceous**).

septate: divided by partitions.

sessile: lacking a stalk, or apparently so; sitting close against the body that supports it.

sinuate: strongly waved.

sinuous: with a wavy edge or margin, sinuate, strongly waved.

sobole: the underground creeping base of a stem, eventually ascending to form an aerial shoot.

spicate (of spikelets): arranged sequentially (at intervals) along an axis; not all arising from one point or so congested as to appear to arise from one point (see digitate).

spiciform: spike-like.

spikelet: unit of the inflorescence in grasses and sedges; an axis (rachilla) carrying bracts (glumes) that may or may not each subtend a floret.

spiral (glumes): as though wound round an axis; helical.

stipitate: having a stipe or special stalk.

stolon: a horizontal stem, usually below ground level, bearing scale leaves and often adventitious roots, giving rise to a new plant at its tip.

striate: marked with parallel lines, grooves or ridges.

subandrogynous: functionally unisexual (female) with vestigial male rudiments.

subglobose: slightly or somewhat less than spherical.

suffrutex (**suffrutices**): subshrubs; relatively low-growing plants with stems woody at the base; the shoots produced perennially.

sympatric: said of taxa whose geographical ranges overlap (see also **allopatric**).

sympatry: the state of having a common geographical range (see also **allopatry**).

sympodial (of rhizomes): a system in which the apical bud has finite growth in the form of an aerial shoot and the lateral buds from its base produce further creeping stems.

synonym: a binomial rejected in favour of a correct binomial.

taxon: (pl. **taxa**) [an invented term that signifies] any definite unit in the classification of plants and animals.

terete: circular in transverse section; imperfectly cylindrical because the object described may taper one or both ways.

trabeculate: cross-barred.

trigonous: three-angled, with plane faces between the angles.

triquetrous: with three sharp angles.

tuberculate: covered with small rounded wart-like projections.

utricle: literally a small bladder; applied to the organ surrounding or enclosing the floret in *Schoenoxiphium* and *Carex* (**perigynium**)

vegetative proliferation: producing offspring as vegetative offshoots from the plant body.

velutinous: velvety, due to an indumentum of erect straight, moderately firm, closely-packed hairs.

verrucose: with a wart-like or nodular surface.

villous: provided with long and soft, not matted, hairs.

vivipary: strictly germination of the seed before shedding from the parent plant: often applied to the production of vegetative shoots from spikelets or other parts of an inflorescence in grasses and sedges.

Key to genera

Note: for convenience, the now accepted terminology applied in the interpretation of floral structure in *Ascolepis*, *Lipocarpha* and *Alinula* has not been used. In consequence, in the key that follows, for these genera, glume = spikelet scale and floret = spikelet. A guide, consisting of four keys, for rapid identification of genera, is given on p. 15.

1a Spikelets consisting of many or few glumes; in all, or some of which, bisexual, or bisexual and unisexual, florets are borne 2
1b Spikelets consisting of many or few glumes; in all, or some of which, only unisexual florets are borne 29

2a Glumes all spirally arranged; OR basal glumes 2-ranked, soon giving place to a spiral arrangement; OR only upper glumes irregularly 2-ranked; OR glumes few in number per spikelet, but these never strictly 2-ranked 3
2b Glumes usually many, strictly 2-ranked (few in *Kyllinga* and often *Mariscus*, but these strictly 2-ranked) 25

3a Glumes many per spikelet (exceeding 12), each subtending a bisexual floret, (occasionally 1–2 basal, or apical, or at both extremes of spikelet, may be reduced and sterile, but these not conspicuous) 4
3b Glumes few to more numerous per spikelet (not exceeding 12), only some fertile (these subtending each a bisexual floret, or bisexual and unisexual florets in various associations with each other). At least two, usually more, fairly well-developed sterile glumes basal in spikelet 19

4a Glumes many; basal 2-ranked, soon giving place to a spiral arrangement. Style base expanded ..... **Abildgaardia**
4b Glumes many; all spiral. Style base expanded or not 5

5a Style base not expanded 6
5b Style base expanded 17

6a Culms nodose, leaf-bearing, usually markedly 3-angled 7
6b Culms nodeless between base and inflorescence. Leaves basal (if poorly developed, plants growing in water, or wet situations; often delicate, soft in texture) 8

7a Inflorescence an *anthela* (occasionally reduced to a head or a solitary spikelet) terminating culm. Bristles accompanying floret ..... **Bolboschoenus**
7b Inflorescence a *panicle* (a series of branches arising from successive culm nodes; occasionally reduced to a single head). Bristles and/or scales generally accompanying floret, these may be rudimentary or lacking ..... **Fuirena**

8a Scales accompanying floret within subtending glume 9
8b Bristles accompanying floret within subtending glume; OR floret nude 11

9a Each floret enclosed by one scale that is larger than subtending glume ..... **Ascolepis**
9b Each floret enclosed, or accompanied, by two or three scales, either smaller or larger than, subtending glume (sometimes difficult to detect because of thin texture and close envelopment of ovary) 10

10a Each floret enclosed by two thin scales usually shorter than subtending glume (sometimes difficult to separate from ovary) ..... **Lipocarpha**
10b Each floret accompanied by two scales as in the contrast, but with third structure present (thin axis equalling or overtopping ovary of floret, sometimes swollen distally) ..... **Alinula**

11a Plants in water, usually floating, occasionally attached to substrate. Rhizomes elongate. Inflorescence an anthela, sometimes reduced to a head. Glumes acuminate, ciliate-margined. Style branches 2. Achene beaked. (Maputaland only) ..... **Oxycaryum**
11b Land plants; if in water then not precisely as for the contrast 12

12a Glume concave, flanks hyaline and enfolding a floret, apex excurrent into long, concave, recurving tip ..... **Lipocarpha**
12b Glume not precisely as for the contrast 13

13a Glume flanks with many nerves (stripes) parallel with midrib. Achene with gynophore (poorly developed in *F. gracilis* which has achene surface transversely ridged). Perennials, often stoloniferous, usually of grassland or rocky situations ..... **Ficinia**
13b Glume flanks lacking many conspicuous longitudinal nerves. Perennials or annuals usually of moist situations 14

14a Leaf blades well developed 15
14b Leaf blades reduced to sheaths only, except occasionally uppermost sheath of shoot which may bear a short blade 16

15a Plants robust, rhizomatous and/or tufted ..... **Scirpus**
15b Plants medium-sized to delicate, usually softly herbaceous ..... **Isolepis**

16a Plants robust, rhizomatous and/or tufted. Bristles usually accompanying floret. (Included here are *Scirpus ficinioides* with retrorsely scabrid bristles much longer than achene and *S. nodosus* with membranous outgrowths between achene base and points of filament attachment) .... **Schoenoplectus**
16b Plants medium-sized to delicate, usually softly herbaceous. Bristles never accompanying floret .... **Isolepis**

17a Leaves reduced to sheaths. Inflorescence a solitary terminal spikelet lacking elongate bracts (sometimes proliferating from near base and giving the impression of branching) .... **Eleocharis**
17b Leaves with blades, or reduced to sheaths only. Inflorescence variable, usually comprising more than one spikelet; if spikelets solitary, then with at least one elongated bract 18

18a Style base shed with style, leaving mature achene apex nude .... **Fimbristylis**
18b Style base persistent on achene until after shedding of style (except *B. hispidula* and occasionally *B. contexta*). Mature achene apex usually carrying style base even after dispersal from spikelet .... **Bulbostylis**

19a Style branches 2, either long or almost obsolete. Achenes biconvex. Style base persistent, as wide as achene at area of contact; if style base narrower then achene hispid at least in part .... **Rhynchospora**
19b Style branches 3 or more, usually well developed. Achenes usually not biconvex, variable in form, sometimes with an apical beak. Style base persistent or not, variable in size and structure 20

20a Tall plants with nodose leafy stems, blades scabrid-margined. Inflorescence a series of branches developed from successive stem nodes, carrying many small spikelets. Florets lacking bristles. Achenes obsoletely trigonous to round, spongy, smooth-surfaced, apex beaked .... **Cladium**
20b Plants not precisely as for the contrast; if tall with nodose leafy stems and inflorescences branched and carrying many spikelets, then bristles accompanying florets 21

21a Spikelets comprising bisexual florets only 22
21b Spikelets comprising bisexual and unisexual florets (these often in close approximation to each other and thus the unisexual florets may be overlooked); sometimes only male florets in *Tetraria cuspidata* 24

22a Florets accompanied by bristles (usually 6 per floret) or by hairy scales (usually 3 per floret, sometimes poorly developed) 23
22b Florets lacking bristles or scales .... **Tetraria**

23a Each floret accompanied by 6 bristles, usually in 2 ranks (occasionally 1 or more somewhat reduced) .... **Carpha**
23b Each floret accompanied by 3 hairy scales (sometimes poorly developed). Plants readily recognised by the inflorescence consisting of a compact head of dark brown spikelets subtended by two bracts with sheathing bases .... **Schoenus**

24a Culm bearing solitary head-like inflorescence consisting of dark brown closely aggregated spikelets subtended by 2 bracts with their bases expanded .... **Schoenus**
24b Inflorescence not precisely as for the contrast .... **Tetraria**

25a Style branches 2 26
25b Style branches 3 28

26a Achenes dorsally compressed, their broad faces lying at right angles to flattened plane of spikelet (previously segregated as genus *Juncellus*) .... **Cyperus**
26b Achenes laterally compressed, their broad faces lying in flattened plane of spikelet 27

27a Spikelets comprising 4–7 glumes, 2 lowest sterile and reduced, remainder subtending bisexual florets, or some from apex downwards sterile or subtending reduced, imperfect, sometimes male, florets. Spikelets crowded into a terminal head that may, or may not, show evidence of subunits of which it is composed; very rarely 1 or 2 peduncled heads added .... **Kyllinga**
27b Spikelets usually comprising more than 7 glumes, 2 lowest, and generally the uppermost, sterile, remainder subtending bisexual florets. Spikelets arranged in an anthelate, usually obviously branched, inflorescence, but in some spp. (*P. macranthus, P. polystachyos* and occasionally others), branches reduced to form a head, in which (unlike many *Kyllinga* spp.) individual spikelets are clearly defined .... **Pycreus**

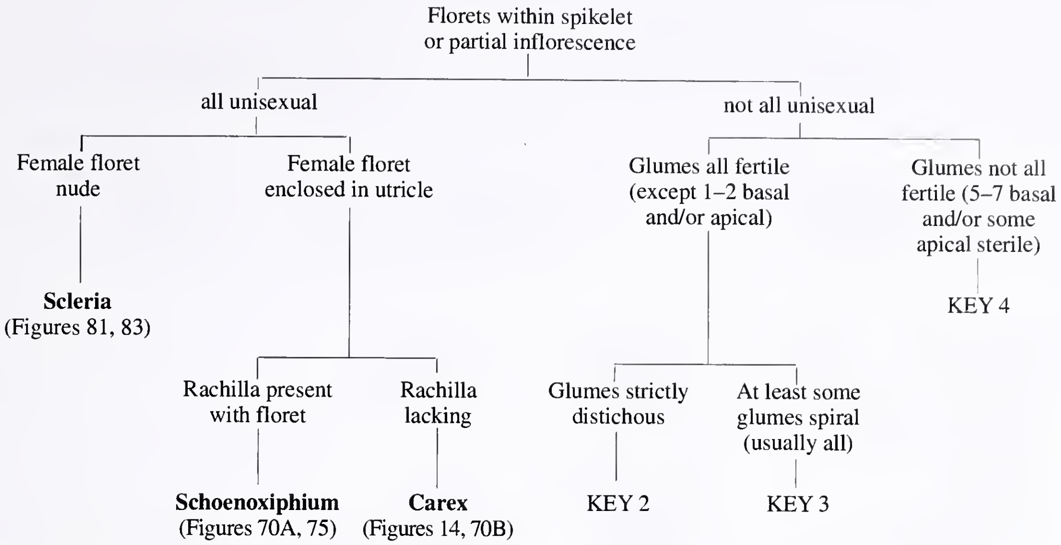
28a Spikelets generally comprising many glumes (more than 12) and perfecting many achenes. Glumes and achenes deciduous from persistent rachillas (except in *Cyperus esculentus* and *C. rotundus* where glumes fall only when spikelets break up) .... **Cyperus**
28b Spikelets generally comprising 12 or fewer glumes and seldom perfecting more than 7 achenes; shed as intact units from inflorescence axis leaving two reduced basal sterile glumes (that eventually fall) and a cushion-like scar for each spikelet .... **Mariscus**

29a Female florets naked within subtending glume. Achene generally ovoid or globose, glabrous or hairy, borne on a stipe that may be expanded at apex into a hypogynium wider than achene .... **Scleria**
29b Female floret enclosed in modified prophyll (the bottle- or sheath-shaped perigynium or utricle) within subtending glume 30

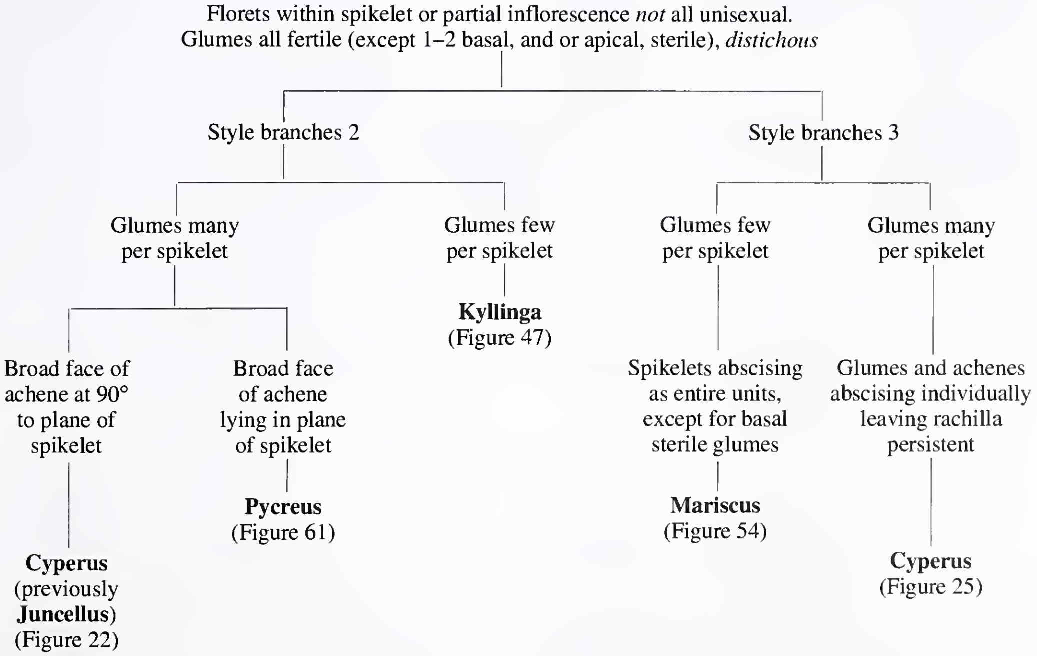
30a Female floret accompanied within utricle by an axis that may be well developed (flattened, veined and bearing apically glumes subtending male florets) or reduced (projection with or lacking glume rudiments, reaching utricle mouth) or rudimentary (flap not exceeding half ovary length) .... **Schoenoxiphium**
30b Female floret unaccompanied within utricle by any visible rudiment of an axis .... **Carex**

Guide for rapid identification of genera

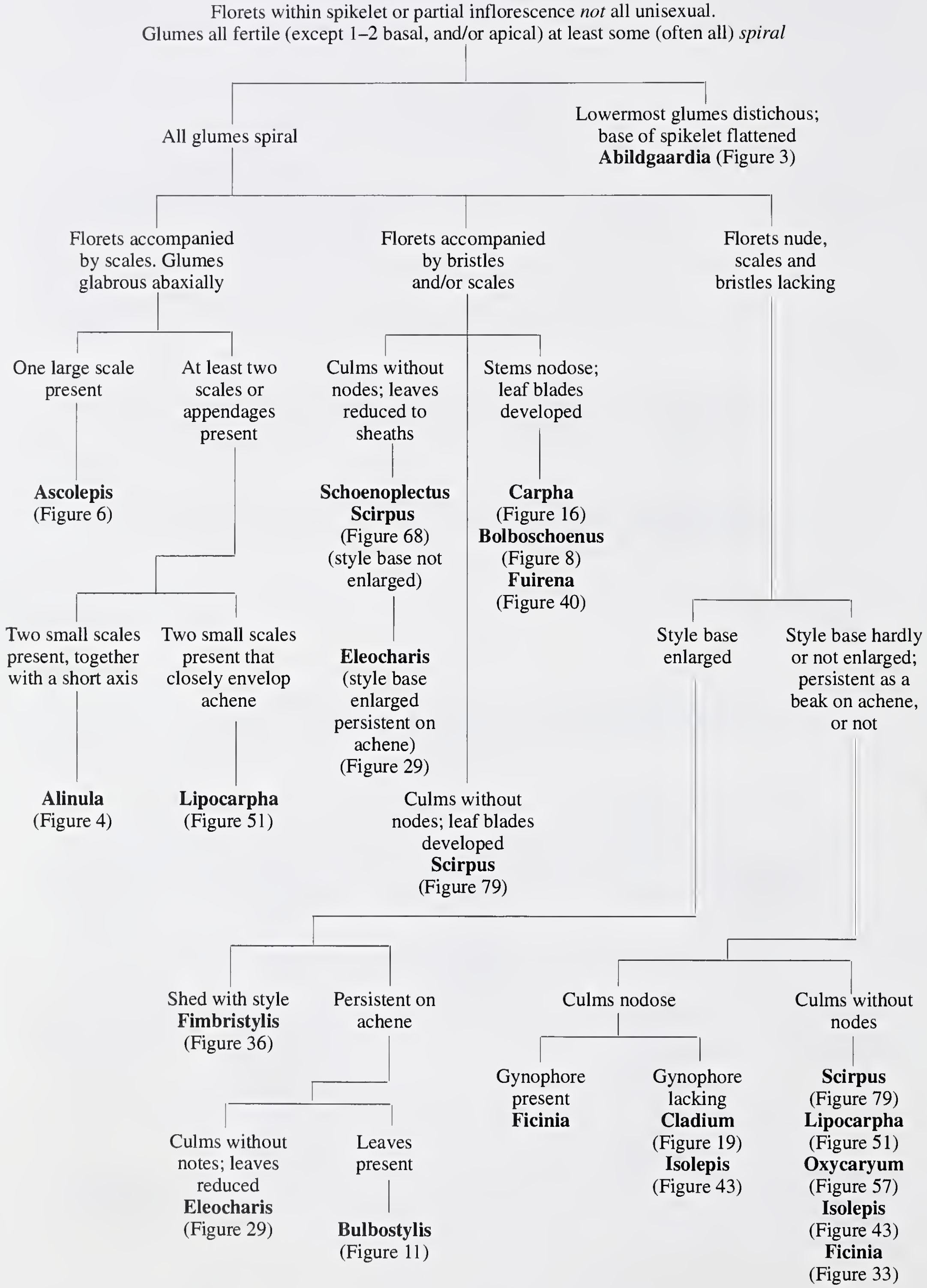
KEY 1


Florets within spikelet or partial inflorescence
all unisexual
not all unisexual
Female floret nude
Female floret enclosed in utricle
Glumes all fertile (except 1–2 basal and/or apical)
Glumes not all fertile (5–7 basal and/or some apical sterile)
Scleria (Figures 81, 83)
KEY 4
Rachilla present with floret
Rachilla lacking
Glumes strictly distichous
At least some glumes spiral (usually all)
Schoenoxiphium (Figures 70A, 75)
Carex (Figures 14, 70B)
KEY 2
KEY 3

KEY 2

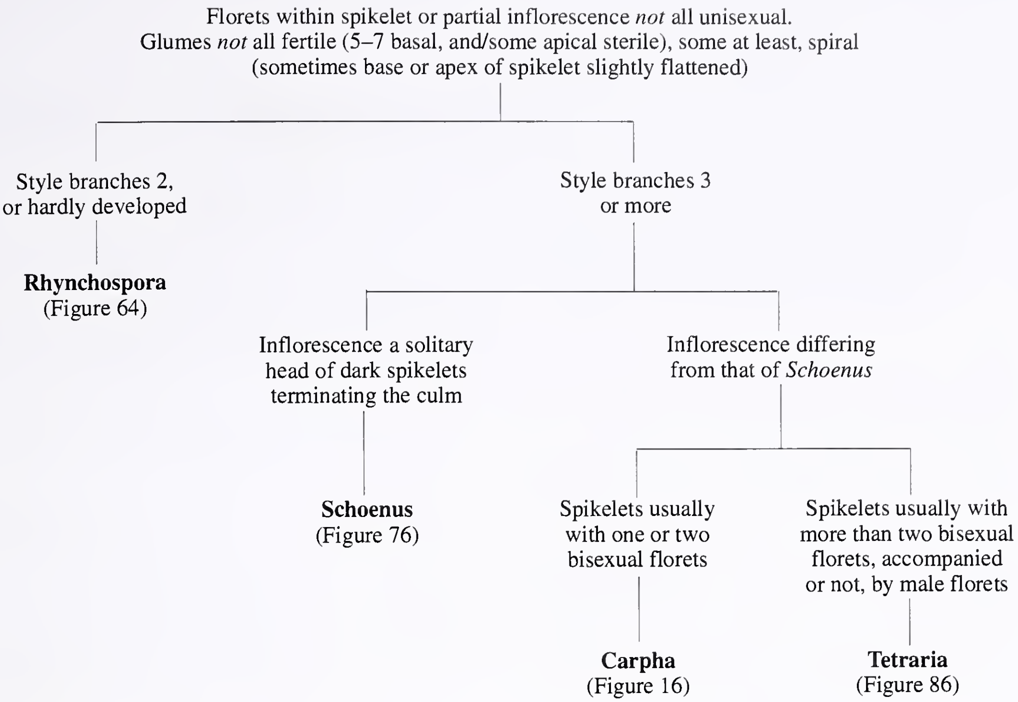

Florets within spikelet or partial inflorescence *not* all unisexual. Glumes all fertile (except 1–2 basal, and or apical, sterile), *distichous*
Style branches 2
Style branches 3
Glumes many per spikelet
Glumes few per spikelet
Glumes few per spikelet
Glumes many per spikelet
Kyllinga (Figure 47)
Broad face of achene at 90° to plane of spikelet
Broad face of achene lying in plane of spikelet
Spikelets abscising as entire units, except for basal sterile glumes
Glumes and achenes abscising individually leaving rachilla persistent
Pycreus (Figure 61)
Mariscus (Figure 54)
Cyperus (previously **Juncellus**) (Figure 22)
Cyperus (Figure 25)

KEY 3



- Florets within spikelet or partial inflorescence *not* all unisexual. Glumes all fertile (except 1–2 basal, and/or apical) at least some (often all) *spiral*
  - All glumes spiral
    - Florets accompanied by scales. Glumes glabrous abaxially
      - One large scale present
        - **Ascolepis** (Figure 6)
      - At least two scales or appendages present
        - Two small scales present, together with a short axis
          - **Alinula** (Figure 4)
        - Two small scales present that closely envelop achene
          - **Lipocarpha** (Figure 51)
    - Florets accompanied by bristles and/or scales
      - Culms without nodes; leaves reduced to sheaths
        - **Schoenoplectus** **Scirpus** (Figure 68) (style base not enlarged)
        - **Eleocharis** (style base enlarged persistent on achene) (Figure 29)
      - Stems nodose; leaf blades developed
        - **Carpha** (Figure 16) **Bolboschoenus** (Figure 8) **Fuirena** (Figure 40)
      - Culms without nodes; leaf blades developed **Scirpus** (Figure 79)
    - Florets nude, scales and bristles lacking
      - Style base enlarged
        - Shed with style **Fimbristylis** (Figure 36)
        - Persistent on achene
          - Culms without notes; leaves reduced **Eleocharis** (Figure 29)
          - Leaves present
            - **Bulbostylis** (Figure 11)
      - Style base hardly or not enlarged; persistent as a beak on achene, or not
        - Culms nodose
          - Gynophore present **Ficinia**
          - Gynophore lacking **Cladium** (Figure 19) **Isolepis** (Figure 43)
        - Culms without nodes
          - **Scirpus** (Figure 79) **Lipocarpha** (Figure 51) **Oxycaryum** (Figure 57) **Isolepis** (Figure 43) **Ficinia** (Figure 33)
  - Lowermost glumes distichous; base of spikelet flattened **Abildgaardia** (Figure 3)

KEY 4



Florets within spikelet or partial inflorescence *not* all unisexual.
Glumes *not* all fertile (5–7 basal, and/some apical sterile), some at least, spiral
(sometimes base or apex of spikelet slightly flattened)

Style branches 2, or hardly developed

Rhynchospora
(Figure 64)

Style branches 3 or more

Inflorescence a solitary head of dark spikelets terminating the culm

Schoenus
(Figure 76)

Inflorescence differing from that of *Schoenus*

Spikelets usually with one or two bisexual florets

Carpha
(Figure 16)

Spikelets usually with more than two bisexual florets, accompanied or not, by male florets

Tetraria
(Figure 86)

Treatment of genera and species

0471020 ABILDGAARDIA

Abildgaardia *Vahl*, Enumeratio plantarum 2: 296 (1805); Lye: 539 (1971a); R.A. Dyer: 885 (1976); R.W. Haines & Lye: 94 (1983) subgenus *Abildgaardia* only; Goetgh. & Coudijzer: 75 (1984). Type species: *Abildgaardia monostachya* (L.) Vahl.

Cyperus Section *Abildgaardia* (Vahl) Endl.: 119 (1836).

Fimbristylis Vahl Section *Abildgaardia* (Vahl) Benth.: 299 (1878).

Fimbristylis Vahl Series Monostachyae Ohwi: 52 (1944).

Note: as here accepted, *Abildgaardia* is delimited by the criteria stipulated by Goetgh. & Coudijzer (1984), namely:

Perennial. Leaf sheath orifice glabrous. Inflorescence anthelate when branched, consisting of 1–3–4 spikelets about 7 mm long. Spikelets laterally compressed, especially basally, pale-coloured, sometimes shining, glabrous. Glumes: lower distichous, upper usually spiralled. Style 3-fid. Achenes stipitate-capitate (obpyriform). Pericarp wall cells isodiametric; small scattered tubercles (warts) present.

In my opinion, this categorisation limits Natal representatives to three species only (*A. ovata, A. triflora, A. hygrophila*). Lye (1971a) transferred two other Natal taxa (*Bulbostylis parvinux* C.B. Clarke and *Fimbristylis variegata* Gordon-Gray) to *Abildgaardia* and this arrangement is followed by Reid in Gibbs Russell *et al.* (1985). Until embryos of the two last-named taxa have been studied and shown to be turbinate of the *Abildgaardia* type, it seems unwise to transfer the species to a genus in which, on a summation of the features given above, they fit less conformably than they do with *Bulbostylis* and *Fimbristylis* respectively. It is interesting that, for Ceylon, Koyama (1985) includes *Abildgaardia* within *Fimbristylis* without comment.

Key to species

1a Leaves reduced to sheaths, the blades filiform, not longer than 3 mm, eventually deciduous. Spikelets compact when young, becoming ragged in age .... 1. *A. hygrophila*
1b Leaves with blades well developed. Spikelets not ragged even in age 2
2a Inflorescence usually a solitary terminal spikelet, occasionally one sessile or one pedicelled spikelet added. Mature achene 2.0–2.8 × 1.2–1.9 mm, green when young becoming fawn then white, shortly stipitate; surface reticulate, faintly to prominently tuberculate (warted) .... 2. *A. ovata*
2b Inflorescence usually an anthela of one central sessile spikelet with 1–4 pedicelled spikelets added (occasionally of one sessile spikelet only) (a range is often present on a single plant or in plants of a local population). Mature achene 2.3–3.1 × 1.5–1.9 mm, markedly stipitate; green when young, becoming fawn to dark brown, eventually almost black, shining; surface reticulate, etuberculate to prominently tuberculate .... 3. *A. triflora*

1. **Abildgaardia hygrophila** (*Gordon-Gray*) *Lye* in Mitteilungen der Botanischen Staatssammlung, München 10: 547 (1971a); Goetgh. & Coudijzer: 65 (1984). Type: South Africa, Natal, Port Shepstone Dist., Port Edward, *K.D. Huntley 701* (NU, holo.; BM, BOL, K, L, NBG, PRE, PRU iso.). Figure 2A, D.

Fimbristylis hygrophila Gordon-Gray: 129 (1966a).

Icones: Gordon-Gray: t. 1, fig. 1 (1966a); Goetgh. & Coudijzer: fig. 2C (1984) achene only.

Vouchers: *K.D. Gordon-Gray 4499; C.J. Ward 2794, 4822, 7228, 9103.*

Description: Gordon-Gray: 130 (1966a).

Distribution: Coast, Maputaland.

Perennial of sandy, black, organically rich, turf soil of vlei areas or hygrophilous grassland where a high water table, slightly saline and poorly aerated conditions persist for most of year. Populations are frequent along entire coastline and are best recognised by spongy leaf sheaths with reduced blades and ragged spikelets with golden brown glumes. Spikelets may reach 32 mm in length by end of growing season (March).

2. **Abildgaardia ovata** *(Burm. f.) Král* in Sida 4: 72 (1971); R.W. Haines & Lye: 94 (1983); Goetgh. & Coudijzer: 86 (1984). Type: from Java. Figures 2B, E; 3.

Carex ovata Burm. f. 194 (1768). *Fimbristylis ovata* (Burm. f.) Kern: 126 (1967); Kern: 565 (1974); T. Koyama: 273 (1985).

Cyperus monostachyos L.: 180 (1771); Rottb.: 18 (1773). *A. monostachya* (L.) Vahl: 296 (1805); Kunth: 247 (1837); Steud.: 72 (1855); Oliv.: 169 (1875). *F. monostachyos* (monostachya) (L.) Hassk.: 61 (1848); Ridl.: 149 (1884); C.B. Clarke: 607 (1894b); C.B. Clarke: 203 (1897/98); C.B. Clarke: 424 (1901/02); Schönland: 34 (1922); Gordon-Gray: 141 (1966b). Type: India, *Koenig s.n.* (LINN, holo.). Doubt exists as to whether Koenig was the collector.

Icones: Rottb.: t. 13, fig. 3 (1773); Oliv.: t. 109, fig. a (1875); Schönland: t. 29 (1922); Gordon-Gray: figs 22–30, 43 (1966b) as *F. monostachyos*; R.W. Haines & Lye: figs 157, 158 (1983).

Vouchers: *K.D. Huntley 539, 556; Moll 1337; C.J. Ward 1618, 5540, 6984; M.C. Ward 1644, 2123.*

Description: Gordon-Gray: 143 (1966b).

Distribution: Coast, Midlands, Zululand, N Natal, Maputaland, Weza.

Tufted perennial most easily recognised by solitary, basally flattened, green spikelets. Frequent in Natal, but not known from Upland areas. Wide variability in size of

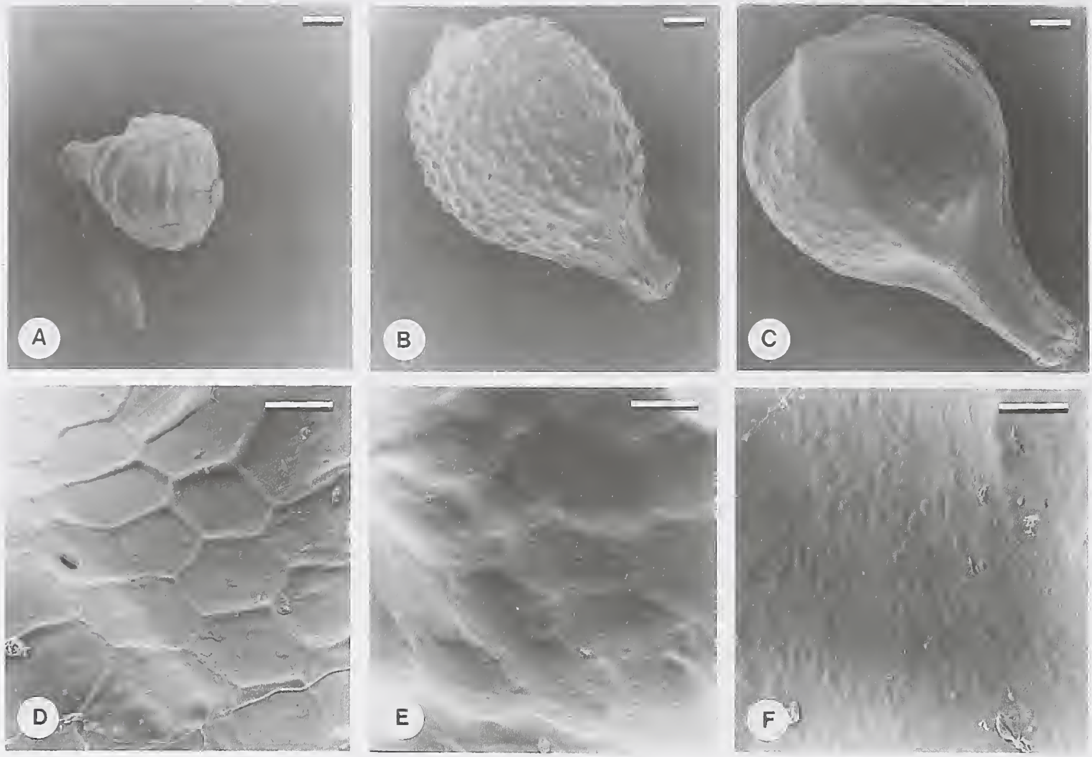


FIGURE 2.—*Abildgaardia*. A, D, *A. hygrophila, Ward 9103*; B, E, *A. ovata, Shirley s.n.; C, F, A. triflora, Ward 4505*. Scale bars: A–C, 250 µm; D–F, 25 µm.

plants occurs. In thornveld and open grassland where vegetational cover is sparse and water in short supply, plants are often 100 mm or less in height with fine leaves: along coast in marshy situations, especially further north, they may be very robust, 400 mm or more, with strong, thick rhizome and much wider leaves. These well-developed specimens approach smaller specimens of *A. triflora* in stature and may be confused unless mature achenes are compared.

3. **Abildgaardia triflora** *(L.) Abeyw.* in Ceylon Journal of Biological Science 2: 135 (1959); R.W. Haines & Lye: 95 (1983); Goetgh. & Coudijzer: 86 (1984). Type: In India Orientali, *Koenig s.n.* (LINN, holo.). Figures 2C, F.

Cyperus triflorus L.: 180 (1771). *Fimbristylis triflora* (L.) K. Schum.: 123 (1895); Turrill: 71 (1925); Podlech: 528 (1960); Gordon-Gray: 147 (1966b); Podlech: 24 (1967); T. Koyama: 271 (1985).

Schoenus cyperoides Retz.: 8 (1789). Type from India.

A. tristachya Vahl: 297 (1805); Kunth: 248 (1837); Boeck.: 54 (1871–1873). A new name for *C. triflorus* and *S. cyperoides*, hence illegit. *F. tristachya* Thwaites: 434 (1864); C.B. Clarke: 610 (1894b); C.B. Clarke: 424 (1901/02) non R. Br. illegit.

Icones: C.B. Clarke: t. 43, figs 12–14 (1909) as *F. tristachya*; Gordon-Gray: figs 35–42, 43 (1966b) as *F. triflora*; R.W. Haines & Lye: fig. 159 (1983); T. Koyama: fig. 19 (1985) as *F. triflora*.

Vouchers: *Moll 4639; C.J. Ward 1706, 1708, 2831, 4342, 4505*.

Description: Gordon-Gray: 147 (1966b).

Distribution: Maputaland.

In Natal, *A. triflora* is reaching the limit of its south-eastern distribution in Africa. This is possibly why culms occasionally carry solitary spikelets instead of an anthela with 2–4 branches. Plants also often shorter than those from tropical localities. Where solitary spikelets predominate, plants may be confused with robust specimens of *A. ovata* (see No. 2), but achenes differ. Halophytic, perennial plants growing in vleis, swamps and seasonally inundated flats. Most easily recognised by green or brownish green, basally flattened spikelets arranged in a simple anthela. Specific epithet based on 3-spikeletted inflorescences, but this number not constant for Natal specimens.

0459050 ALINULA

Alinula *J. Raynal* in Adansonia Ser. 2, 17: 43 (1977a). Type species: *A. lipocarphoides* (Kük.) J. Raynal (*Ficinia lipocarphoides* Kük.).

Aliniella J. Raynal: 157 (1973) non Skvortzow (Euglenophyta).

Cyperus L. subgen. *Alinula* (J. Raynal) Lye: 230 (1983a); R.W. Haines & Lye: 250 (1983). *Cyperus* L. subgen. *Fimbricyperus* Lye: 60 (1981a).

A small genus of slender annual plants that has general affinity with *Lipocarpha* R. Br. In addition to structural features of *Lipocarpha*, *Alinula* has an axis, the apex of which may carry a second reduced glume, or there may be an outgrowth surrounding achene base that is interpreted as a hypogynium.

One species in Natal, rare, or perhaps overlooked.

1. **Alinula paradoxa** *(Cherm.) Goetgh. & Vorster* in Bulletin Jardin Botanique Nationale de Belgique 58: 457 (1988); Cl. Reid: 277 (1989). Type: Madagascar, Stampika, *Perrier de la Bâthie 2423b* (P, holo.). Figures 4 & 5.

Lipocarpha paradoxa Cherm.: 425 (1921). *Mariscus paradoxus* (Cherm.) Cherm.: 169 (1925); Cherm.: 29 (1936/37); Podlech: 525 (1960); Podlech: 38 (1967). *Pseudolipocarpha paradoxa* (Cherm.) Vorster: 319 (1978a) ined.

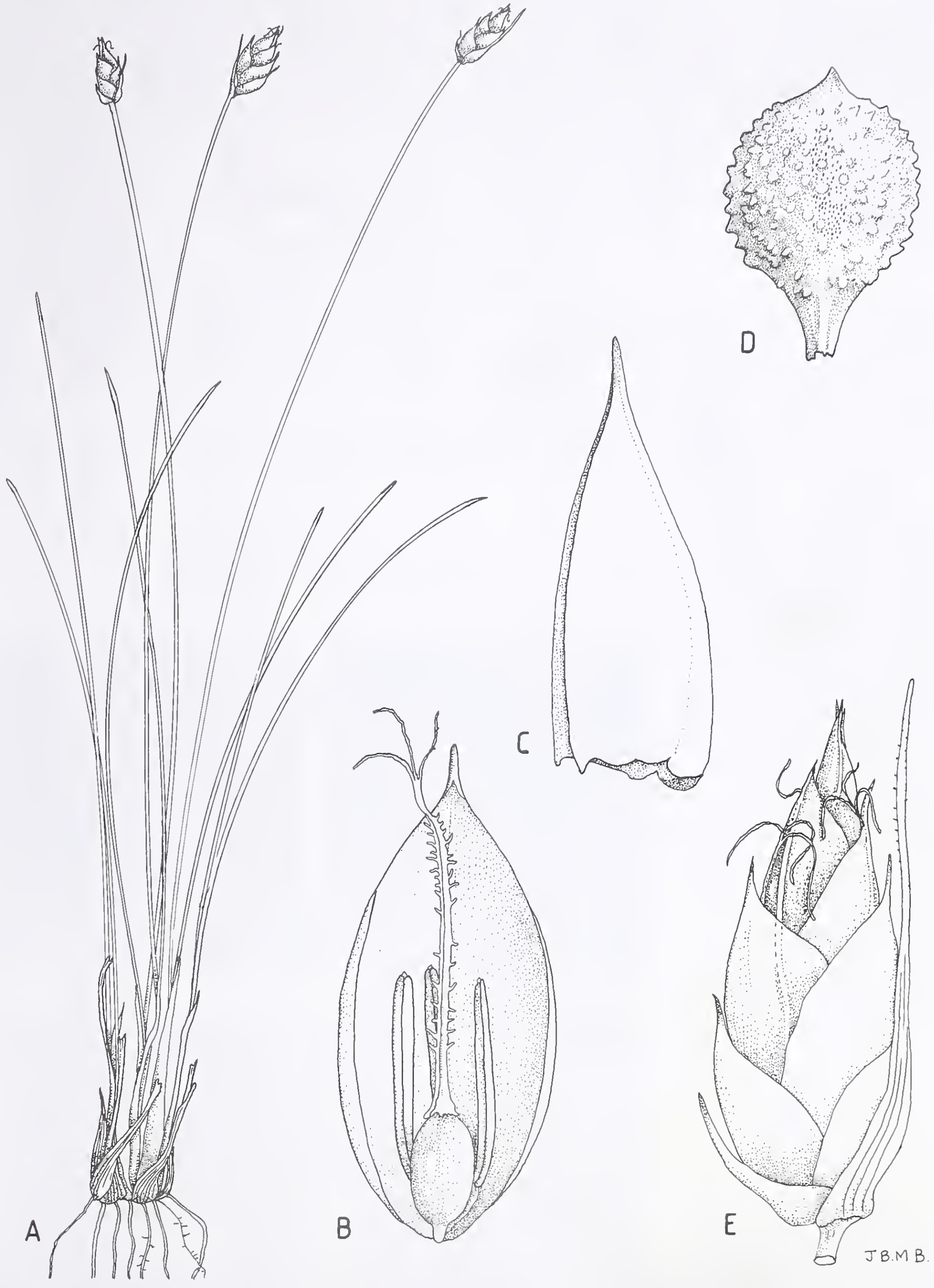


FIGURE 3.—*Abildgaardia ovata, M.C. Ward 1644.* A, plant, × 1; B, floret within glume, × 15; C, glume, lateral view, × 11; D, achene, × 20; E, spikelet, with distichous basal glumes: spikelets lengthen with age and glumes become spiralled, × 9.

Cyperus subparadoxus Kük. 525 (1936); Suess.. & Merxm.: 164 (1952) non Steud. (1855); R.W. Haines & Lye: 251 (1983).

Icones: Cherm.: figs 2, 8–10 (1936/37) as *M. paradoxus*; R.W. Haines & Lye: fig. 506 (1983) as *C. subparadoxus*.

Voucher: *Cl. Reid 1027* (PRE).

Description: R.W. Haines & Lye: 251 (1983) as *C. subparadoxus*.

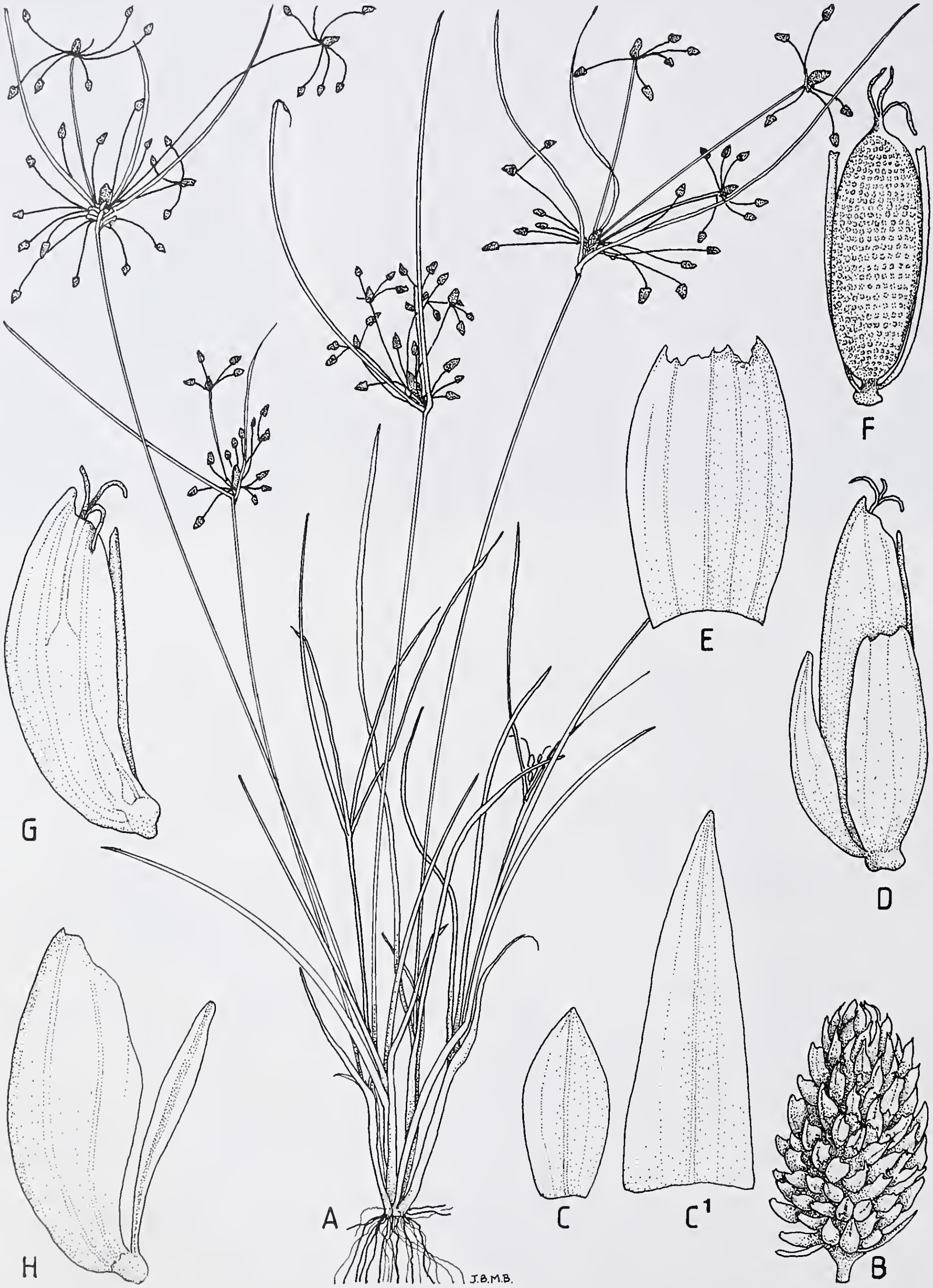


FIGURE 4.—*Alinula paradoxa*, *Cl. Reid 1027* (NH). A, plant, × 1; B, spike of inflorescence, × 14; C, bract from upper portion of spike, × 60; C1, lowest bract of spike, × 60; D, spikelet and bract, × 68; E, prophyll, × 85; F, achene with filaments, × 60; G, glume containing a floret, × 75; H, glume and axis of spikelet with floret removed, × 75.

Distribution: Maputaland.

Dwarf, annual, leaf-bearing herbs that form slender tufts in moist soil adjacent to water. Spreading, usually bi-compound, anthelate inflorescence carries dark spikelets and, on superficial inspection, can be mistaken for a small *Fimbristylis*. Rays each terminate in a short dark spike comprising closely packed spiral bracts, each of which subtends a one-flowered spikelet composed of adaxial prophyll, larger abaxial glume that subtends bisexual, 2-staminate floret with 3 style branches, and a second, upper, very slender glume terminating persistent spikelet axis. So far, the species is without close relatives.

0454000 ASCOLEPIS

Ascolepis *Nees ex Steud.*, Synopsis plantarum glumacearum 2 Cyperaceae: 105 (1855) ; C.B. Clarke: 266 (1897/98); C.B. Clarke: 473 (1901/02); Schönland: 54 (1922); Podlech: 3 (1967); R.A. Dyer: 880 (1976); Goetgh.: 435 (1977); Goetgh.: 269 (1980); R.W. Haines & Lye: 302 (1983). Type species: *A. eriocauloides* (Steud.) Nees ex Steud., type conserved.

Platylepis Kunth: 269 (1837) non A. Rich. (1828) (Orchidaceae). Syntypes: *P. capensis* Kunth, *P. brasiliensis* Kunth.

Antrolepis Welw.: 578 (1859) name provisional.

Only one species occurs in Natal. Genus easy to recognise by neat, compact, snow-white, hemisphaerical inflorescences born terminally on slender, nodeless culms. Expanded bases of two or three outer bracts closely envelop each head; their elongate slender tips are patent or descending (Figure 6). Usually plants grow as isolated tufts in vleis, often in water, therefore distinguishable from the only other entities with which confusion is likely (*Kyllinga alba, Mariscus dubius*, both of which occupy much drier situations).

Inflorescence structure has been variously explained. The interpretation followed here is that accepted by Goetghebeur (1980). Each head represents a state of considerable reduction and contraction of 2–4(–6) spikes bearing densely spirally imbricated spikelets each subtended by a small bract. Each spikelet consists of a single glume enclosing a single floret. In some species glumes of outermost spikelets are long attenuate, giving an aster-like form to inflorescence, but this is not so in the Natal species.

1. **Ascolepis capensis** *(Kunth) Ridl.* in Transactions of the Linnean Society, Ser. 2, Botany, 2: 164 (1884); C.B. Clarke: 266 (1897/98); C.B. Clarke: 477 (1901/02); Schönland: 54 (1922); Goetgh.: 291 (1980); R.W. Haines & Lye: 310 (1983); Hilliard: 52 (1987); Hilliard & B.L. Burtt: 113 (1987). Type: South Africa, Cape Province, *Drège 4389* (P, iso.). Figures 6 & 7.

Platylepis capensis Kunth: 269 (1837).

P. dioeca Steud.: 131 (1854). Type: South Africa, Cape Province, *Drège 3953* (P, holo.).

A. capensis (Kunth) Ridl. var. *lacera* C.B. Clarke: 651 (1894b). Type: Nigeria, *Barter s.n.* (K, holo.).

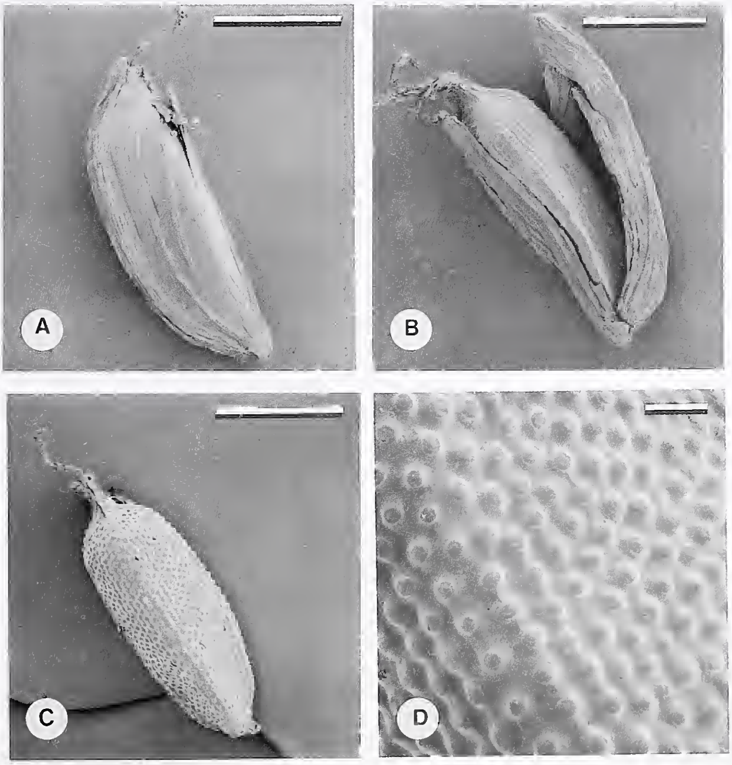


FIGURE 5.—*Alinula paradoxa*, *Cl. Reid 1027* (NH). A, glume and axis containing floret; B, glume displaced to show achene; C, achene; D, surface detail of achene. Scale bars: A–C, 250 µm; D, 25 µm.

Icones: C.B. Clarke: t. 61, figs 8–10 (1909); Schönland: t. 57 (1922); Goetgh.: t. 8 (1980); R.W. Haines & Lye: fig. 641 (1983); Davis in Hilliard: 52 (1987).

Vouchers: *Hilliard & B.L. Burtt 13788, 13982; K.D. Huntley 106; I'Ons 5/83.*

Description: R.W. Haines & Lye: 310 (1983).

Distribution: South coast, Midlands, Uplands, N Natal, Kokstad.

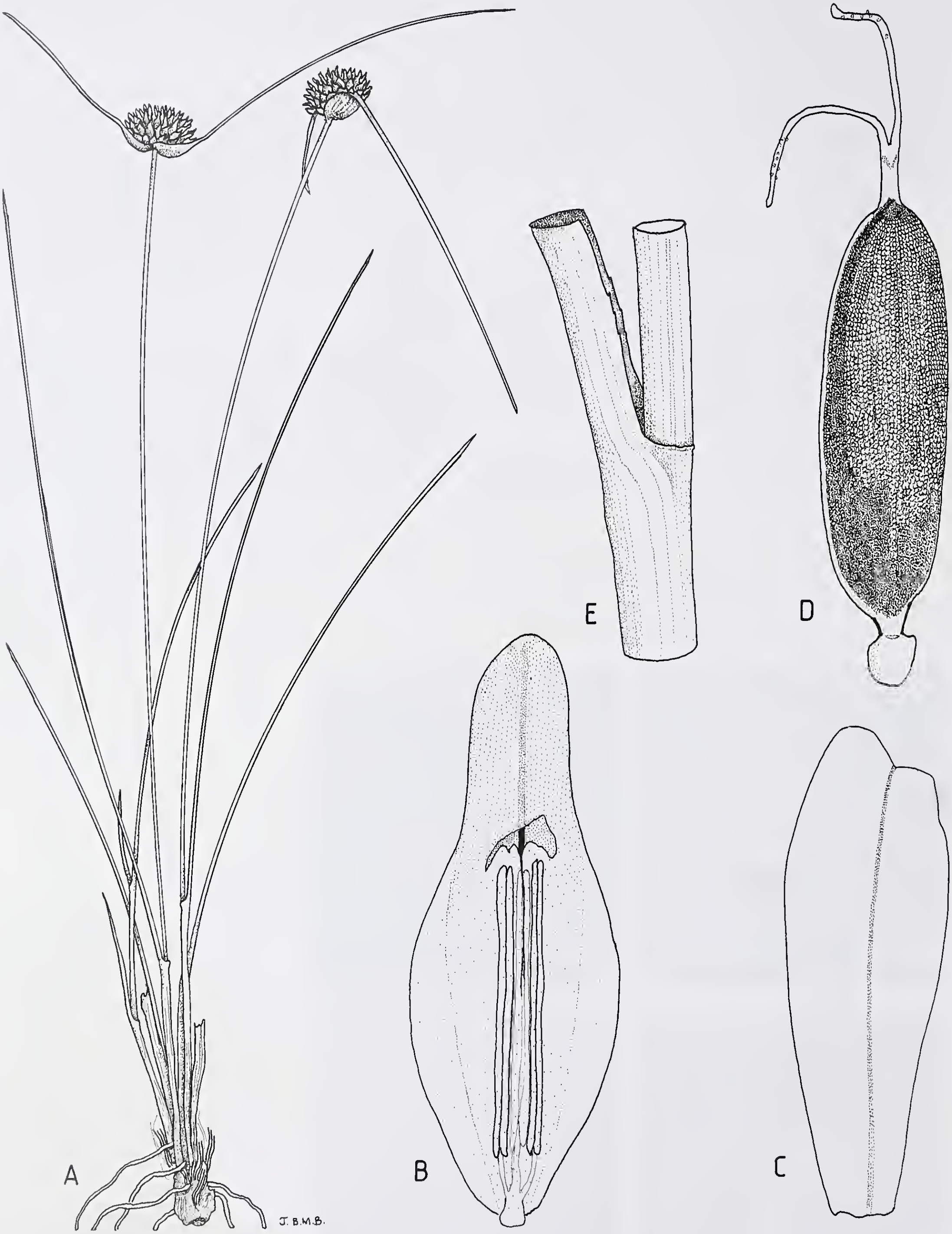


FIGURE 6.—*Ascolepis capensis*: A, *Huntley 106*; B & C, *K.D. Gordon-Gray 5020*; D, *I'Ons 34/81*; E, *Hilliard & B.L. Burtt 13788*. A, plant, blackish, fibrous leaf sheaths mostly removed, × 1; B, glume, adaxial surface, note fused margins enclose the young floret of which ovary and style arms are not discernible, × 21; C, bract, abaxial surface, × 26; D, achene, note slightly bulbous stipe, × 36; E, young leaf showing closed sheath and slightly scabrid margin, × 10.

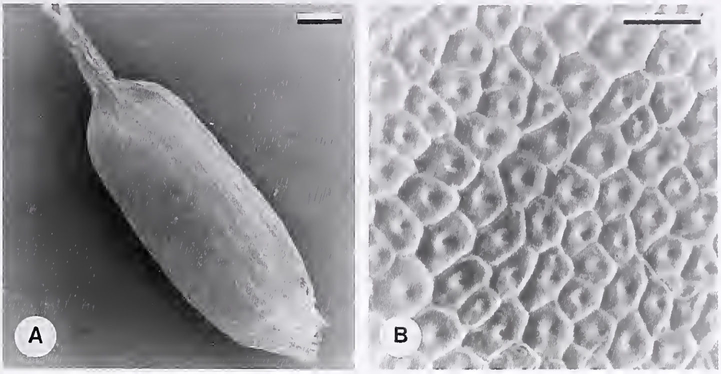


FIGURE 7.—*Ascolepis capensis, I'Ons 34/81.* Scale bars: A, 250 µm; B, 25 µm.

Ascolepis capensis is African with a distributional range from Mali and Sierra Leone to Ethiopia and south to the eastern Cape Province. In Natal it is nowhere common. Dorsiventrally compressed glume (squamella) with its adaxial cleft through which two-branched style of floret protrudes, is variable in outline (probably dependent upon degree of maturation), often with more markedly developed 'shoulders' and lateral wings than illustrated in Figure 6B. Goetghebeur (1980) remarks that most specimens of the genus have but very few or no ripe fruits at all. Ripe achenes were also exceptional within heads of Natal plants of *A. capensis*, but this may be accounted for, perhaps, by the collection of a majority of specimens early in the growing season. Each is shed enclosed within its glume. Once removed from soil, plants are further characterised by blackish persistent leaf bases of shoots (mostly fallen away from shoot illustrated in Figure 6A). Slender underground stolons are developed but are seldom represented in herbarium specimens. Schönland (1922) remarks 'This plant is often confused with *Kyllinga alba*. The leaf sheaths are not closed.' The second statement should be ignored since both *K. alba* and *A. capensis* have closed sheaths.

0468030 BOLBOSCHOENUS

Bolboschoenus *(Asch.) Palla* in E. Hallier & A. Brand, W.D.J. Koch's Synopsis der deutschen und schweizer Flora 3: 2531 (1905); K.L. Wilson: 156 (1981). Type species: *B. maritimus* (L.) Palla (= *Scirpus maritimus* L.).

Scirpus Section *Bolboschoenus* Asch.: 753 (1864); T. Koyama: 288 (1958).

There is considerable difference of opinion as to whether or not, *Bolboschoenus* should be recognised as a genus in its own right. Its noded culms, terminal inflorescence and leafy bracts set it apart from *Schoenoplectus* Palla, as does its embryo type (more highly differentiated than that of *Schoenoplectus*) (Wilson 1981). But if it is included within this genus (an arrangement still followed by many authorities including Haines & Lye 1983), then it is illogical to segregate *Hymenochaeta* P. Beauv. ex Lestib. According to Wilson (*l.c.*) there are about 16 species referable to *Bolboschoenus*; these are distributed on all continents and greatly in need of worldwide study to clarify specific limits.

One species only is known from Natal and is limited to the extension of the Mozambique plain (Maputaland). Pending further study it is segregated under *Bolboschoenus*, following Wilson (*l.c.*).

***Bolboschoenus maritimus** *(L.) Palla* in E. Hallier & A. Brand, W.D.J. Koch's Synopsis der deutschen und schweizer Flora 3: 2531 (1905). Type: from Europe. Figures 8 & 9.

Scirpus maritimus L.: 74 (1753); Thunb: 17 (1794); Thunb.: 369 (1811); Nees: 509 (1832); Nees: 184 (1835); Kunth: 167 (1837); Boeck.: 722 (1869/70); Ridl.: 158 (1884); C.B. Clarke: 626 (1894b); C.B. Clarke: 232 (1897/98): C.B. Clarke: 455 (1901/02); P.L. Forbes: 62 (1987b). *Schoenoplectus maritimus* (L.) Lye: 145 (1971d); R.W. Haines & Lye: 53 (1983).

Icones: R.W. Haines & Lye: fig. 64 (1983).

Vouchers: *C.J. Ward & F.L. Farquharson 10037; C.J. Ward 1707, 3485, 7750, 8788.*

Description: R.W. Haines & Lye: 53 (1983).

Distribution: Maputaland.

It is not likely that plants of *B. maritimus* will be mistaken for any other Natal sedge. Robust perennials spreading by thick, fairly hard stolons with cormose swellings, in damp to wet, organically enriched, sandy, rather saline substrate of vlei and pan margins. Noded, leafy, 3-angled culms often basally swollen, from 0.5–1.0 m in height. Terminal inflorescence anthelate, or reduced to a head of few, or a solitary, spikelet. Additional diagnostic features are glumes, each with an irregular, frayed apex, excurrent midrib and scabrid-hairy abaxial surface. Perianth of six (occasionally 5), retrorsely-barbed hypogynous bristles present. The species is recorded for tropical Africa and is widespread through the northern hemisphere.

0471010 BULBOSTYLIS

Bulbostylis *Kunth ex C.B. Clarke* in Flora of British India 6: 651 (1893/94), nom. conserv.; C.B. Clarke: 204 (1897/98); C.B. Clarke: 427 (1901/02); Schönland: 35 (1922); Gordon-Gray: 221 (1959); Podlech: 4 (1967); Lye: 539 (1971a); R.A. Dyer: 885 (1976); Goetgh. & Coudijzer: 75 (1984); Goetgh. & Coudijzer: 207 (1985). Type species: *B. capillaris* (L.) C.B. Clarke, type conserved.

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* See addendum.

Fimbristylis Vahl Sect. *Oncostylis* Benth. in Benth. & Hook. f.: 1049 (1883).

Abildgaardia Vahl subgen. *Bulbostylis* (C.B. Clarke) Lye: 757 (1982a); R.W. Haines & Lye: 95 (1983).

Note: as here accepted, *Bulbostylis* is delimited by the criteria stipulated by Goetghebeur & Coudijzer (1984)

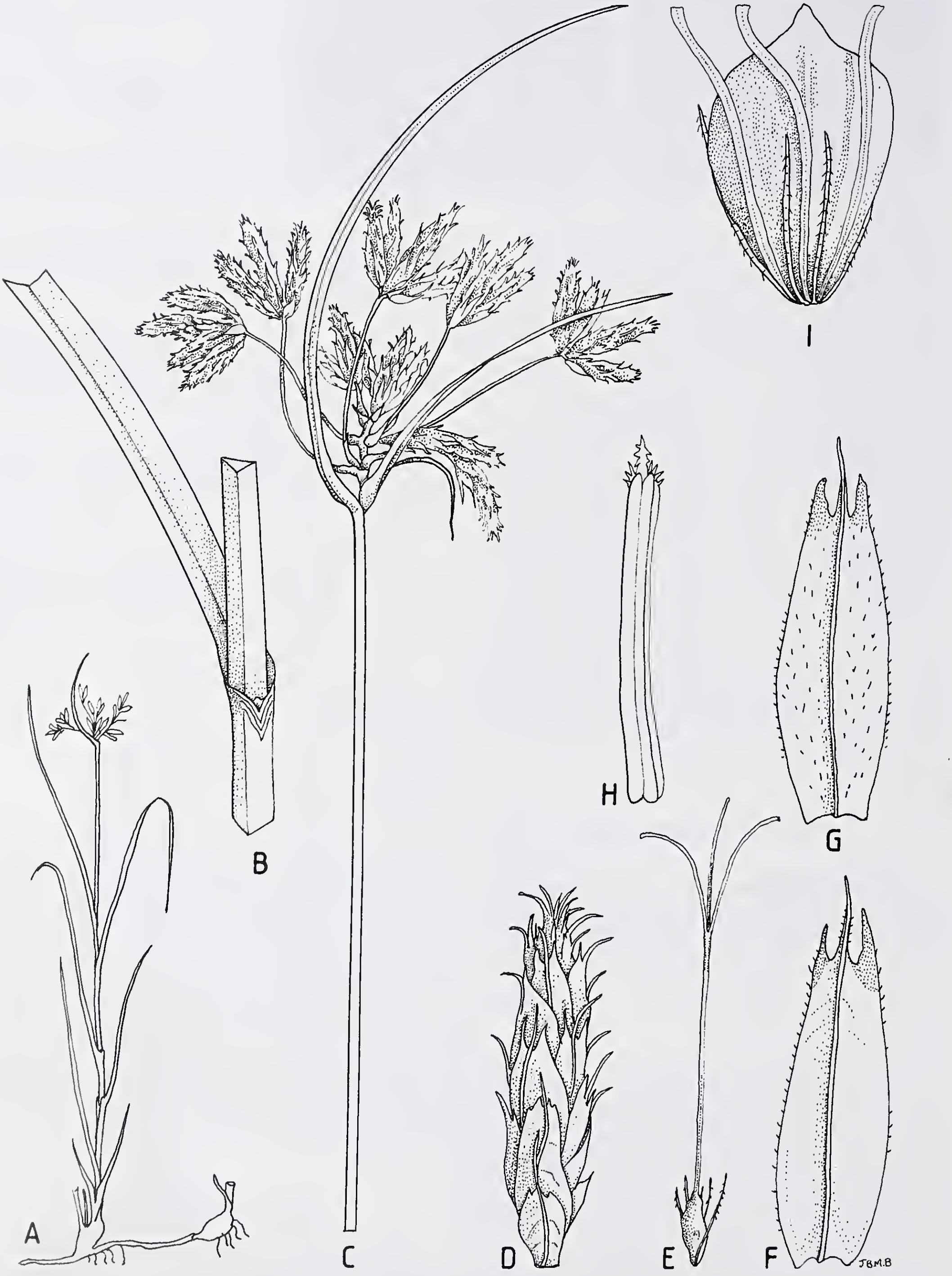

FIGURE 8.—*Bolboschoenus maritimus*, A–F & I, *Ward 1707*; G & H, *Ward 3485*. A, plant, × 0.1; B, part of leaf sheath, leaf and culm, × 2; C, inflorescence, × 1; D, spikelet, × 4; E, young ovary, bristles and style branches, × 10; F, G, glume, adaxial and abaxial surfaces, × 10; H, anther with anther crest, × 15; I, achene with bristles and attached filaments, × 20.

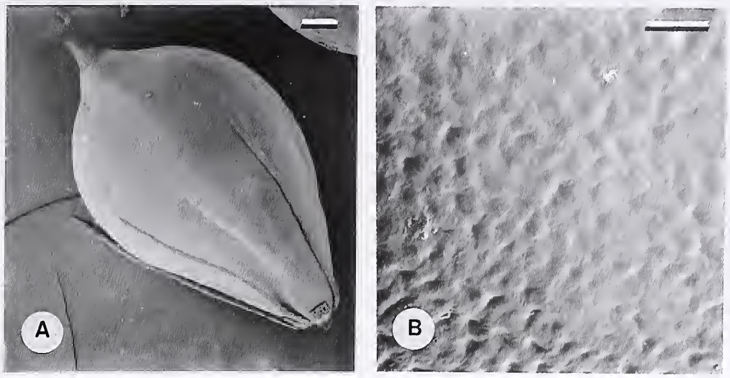

FIGURE 9.—*Bolboschoenus maritimus, Ward 1707.* Scale bars: A, 250 µm; B, 25 µm.

namely: style base enlarged, often persistent on ripe achene; if deciduous, then pericarp consisting of vertically elongate cells arranged in irregular transverse rows so that achene surface appears transversely wavy and ridged (since junctions of cell rows are slightly depressed). Inflorescence anthelate, capitate, or spikelets solitary. Mouth of leaf sheath usually bearded with long, slender hairs.

The species previously known as *Fimbristylis hispidula* (Vahl) Kunth is now included within *Bulbostylis.*

Key to species

Note: identification of Natal species of this genus is not straightforward. Several species are similar in general morphology; almost all exhibit unusually wide variability, especially in inflorescence form (see Gordon-Gray: 552–557, 1971). Taxa that might be doubtful are included in both alternatives. *B. arenaria* is not known in Africa. Correct name is *B. humilis* (Kunth) C.B. Clark (see addendum p. 209).

1a Plants perennial, tufted, or with clearly defined rhizome 2
1b Plants annual, usually sparsely tufted, without means of underground perennation 12

2a Mature inflorescence a spherical head, lower spikelets reflexed until almost in contact with culm. Spikelets compressed. Mature achene 0.8–1.2 × 0.5–1.0 mm, surface faintly reticulate. Sheath mouth and young inflorescence bearded by fine curled 'woolly' white hairs (Maputaland only) .... 8. *B. parvinux*
2b If mature inflorescence is a single head, then spikelets not reflexed against culm, head hemispherical or almost so. Spikelets not compressed, or in other ways distinguishable from the precise details of the contrast 3

3a Mature inflorescence invariably a single head of 12–15 sessile spikelets, closely packed when young, distinct at maturity when they are polygonal-cylindric, dull dark brown with lighter brown markings. Glumes 1.7–2.7 × 2.1–3.3 mm, ovate. Achenes 0.9–1.5 × 0.6–1.1 mm, surface reticulate, almost smooth, or finely transversely lineolate, never punctate; style base faintly 3-angled, not vertically flattened. Culms usually densely white-hispid velutinous below inflorescence .... 10. *B. scabricaulis*
3b Mature inflorescences branched or reduced to solitary spikelets; if always a single head, then not fitting precisely the criteria of the contrast 4

4a Sheath mouth indistinctly bearded even when young, long hairs soon breaking away. Glumes with midvein terminating slightly below apex, not excurrent into a minute mucro; glume apex rounded (obtuse) to emarginate, margin minutely white-ciliate (best seen in young spikelets or towards apex of older ones) 5
4b Sheath mouth distinctly bearded with long hairs. Glumes with midvein terminating in apex or excurrent into a minute mucro; margin usually glabrous, but variable 6

5a Shoots clothed with persistent soft brown leaf sheaths. Plants usually in water or in very damp situations. Glume apices clearly rounded to emarginate, midvein terminating below apex, margin minutely white-ciliate .... 11. *B. schoenoides**
5b Shoots clothed with persistent hard, coarse, dark brown to black leaf sheaths. Plants usually in grassland, often not far from water, but not in it. Glume apices as for *B. schoenoides* when young, but soon becoming lacerated, fragments appearing acute; termination of midvein below glume apex only apparent in young glumes; glume margins not always minutely white-ciliate .... 12. *B. scleropus**

6a Leaf blades mostly reduced to apiculate projections from sheath mouth, sometimes uppermost (innermost) sheath of shoot with blade better developed 7
6b Leaf blades well developed, filiform or hardly wider 8

7a Shoot bases swollen (cormose) confluent in a uniseriate (sometimes biseriate or irregularly tufted) row. Glumes 2.4–3.6 mm long. Inflorescence a single head accompanied on same plant by culms bearing solitary spikelets (occasionally herbarium specimens may show only solitary spikelets, or a head to which a pedicelled spikelet is added). Plants fine .... 7. *B. oritrephes*
7b Shoot bases confluent, slightly swollen (but never markedly cormose) in bi- to multiseriate rows, occasionally irregularly tufted. Glumes 4.1–5.8 mm long. Inflorescence a hemispherical head with, sometimes, 2–4 branches added; very occasionally reduced to a single spikelet. Plants coarse .... 2. *B. boeckeleriana*

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* These species are not clearly distinct morphologically. There are intermediates which are sometimes difficult to place.

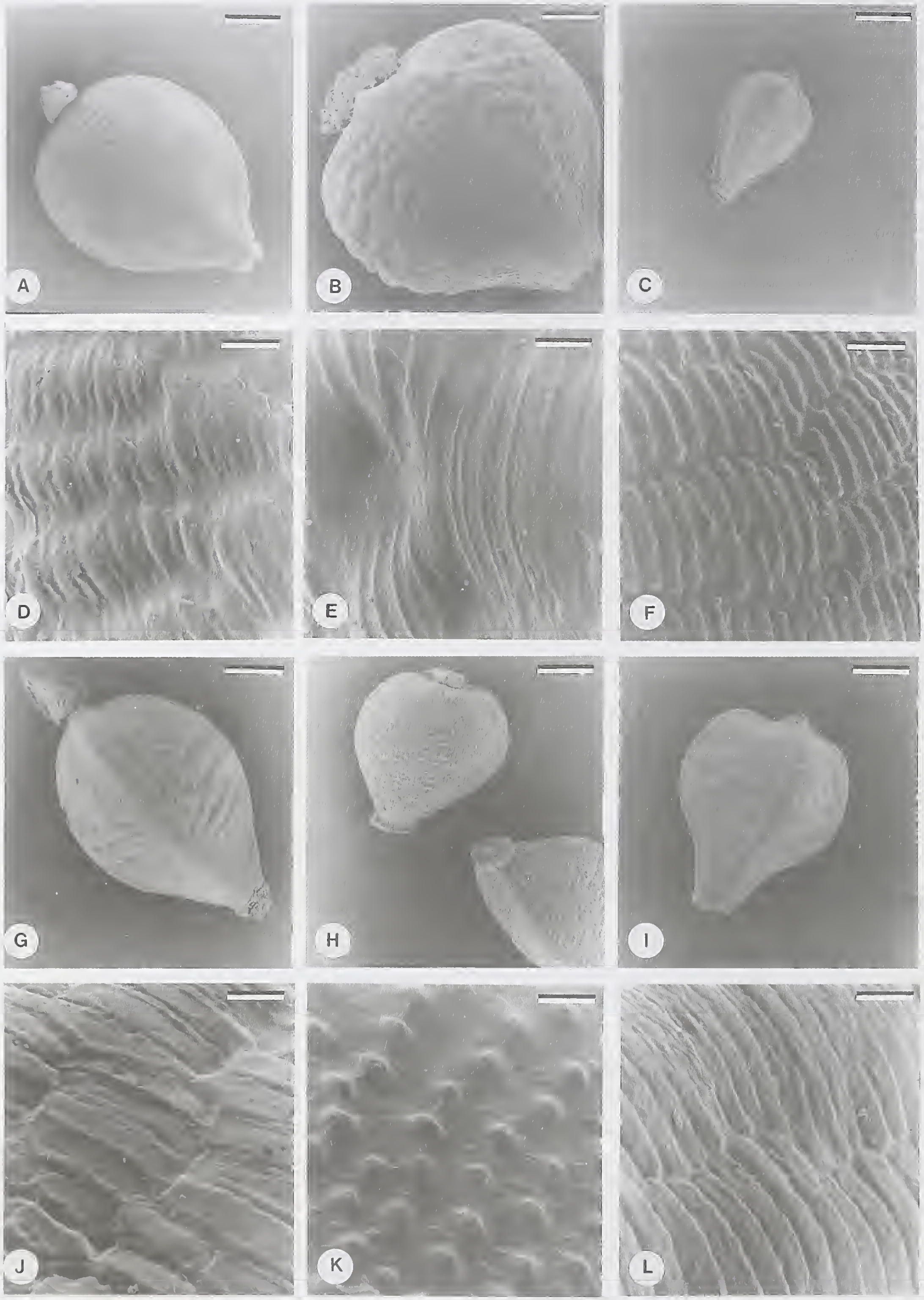

FIGURE 10.—*Bulbostylis*. A, D, *B. arenaria, Huntley 397*; B, E, *B. boeckeleriana, MacDonald 117*; C, F, *B. burchellii, Loxton 067*; G, J, *B. contexta, J. Browning 161*; H, K, *B. densa* subsp. *afromontana, Hancox s.n.*; I, L, *B. hispidula* subsp. *pyriformis, Ross 741*. Scale bars: A–C, G–I, 250 µm; D–F, J–L, 25 µm.

8a Inflorescence an open branched anthela of at least 15 spikelets, most of these arranged as single pedicelled units 9
8b Inflorescence variable, (often on the same plant or on closely associated plants) EITHER single heads mixed, or not, with heads with branches added; OR single heads mixed, or not, with solitary spikelets; OR all possibilities together 10

9a Style base round in outline, vertically flattened, persistent on achene. Achene 0.6–1.0 mm long (excluding style base), 0.4–0.7 mm wide . . . . 3. *B. burchellii*
9b Style base pyramidal, only temporarily persistent on achene. Achene 1.0–2.0 mm long (excluding style base), 0.8–1.3 mm wide . . . . 4. *B. contexta*

10a Glumes 2.4–3.6 mm long, dark chestnut-red to black. Plants usually recognisable by swollen cormose shoot bases confluent in a uniseriate row (see further details under 7a of this key) . . . . 7. *B. oritrephes*
10b Glumes (at least the largest) 3.6–5.8 mm long, varying in shades of brown from light to dark, but seldom dark chestnut-red. Plants with confluent shoot bases forming a bi- to multiseriate row or irregularly tufted, OR rhizome merely connecting closely aggregated shoots within a compact tuft with the shoot bases slightly or not swollen 11

11a Plants coarse with rather irregular, untidy rhizome; some of scale leaves and leaf sheaths with evident tufts of white 'woolly' hairs at mouths; usually some leaf blades reduced . . . . 2. *B. boeckeleriana*
11b Plants medium to fine, sometimes with uniseriate rhizome, bases not swollen; more usually neatly tufted. Leaf blades not reduced, hairs from sheath mouths well developed but not white 'woolly' . . . . 4. *B. contexta*

12a Style base vertically flattened, almost round in outline, persistent upon achene, never shed with style 13
12b Style base pyramidal or triangular in shape and angular in outline, not always permanent upon achene, sometimes shed with, or soon after, style 14

13a Slender annual: plants often flexuous and drooping, sometimes prostrate on soil surface especially after inundation by water, occasionally erect. *Spikelets small, gaping at maturity, achenes partially exposed.* Glumes dark brown, ovate to lanceolate-triangular . . . . 5. *B. densa**
13b Small annual: plants short and firm, usually erect not flexuous. *Spikelets not gaping at maturity, achenes usually not clearly exposed.* Glumes medium brown, lanceolate . . . . 9. *B. pusilla**

14a Inflorescence a branching anthela of ± 10 spikelets, branches mostly patent or recurved. Glumes dark brown with lighter keels, broadly boat-shaped with, or without, a short, recurved mucro. Style base pyramidal, frequently shed with style, or very shortly after. Achene pyriform. A very common weed, particularly of sandy areas . . . . 6. *B. hispidula*
14b Inflorescence either unbranched and glumes pallid, long mucronate (*B. arenaria*), OR if branched, the branches erect or slightly angled, not patent or recurved. Glumes usually mid-brown, if very dark, then not broadly boat-shaped, rather ovate-oblong to elliptic-oblong, usually acute; mucro, if present, minute. Achene obovate. Style base pyramidal, usually persistent until after style has fallen 15

15a Inflorescence unbranched, either a single head of few sessile spikelets, or reduced to a solitary sessile spikelet (both possibilities often present on same plant). Glumes pale brown or fawn, long mucronate. Style branches 2 or 3, sometimes on same plant. A common annual, ruderal weed . . . . 1. *B. arenaria* (including *B. breviculmis* and *B. striatella*)
15b Inflorescence branched: if unbranched then glumes mid-brown to dark brown, lacking a long mucro. Style branches 3. Some evidence of a rhizome can generally be made out, for the species is more often perennial than annual . . . . . . 4. *B. contexta*

1. **Bulbostylis arenaria** *(Nees).* See addendum p. 209; Bodard: 72 (1963). Syntypes: Cape Province, Uitenhage Dist., Zwartkops River, *Zeyher 884* (BOL); Natal, Inanda (?) *Drège 4374*. Figure 10A, D.

Isolepis arenaria Nees: 291 (1834b) nom. nud. *Fimbristylis arenaria* Nees: 146 (1835); Kunth: 244 (1837). *Scirpus arenarius* Boeck.: 741 (1869/70); Beetle: 456 (1949).

I. breviculmis Kunth: 207 (1837); Steud.: 100 (1855). *S. breviculmis* Boeck.: 510 (1869/70). *B. breviculmis* (Kunth) C.B. Clarke: 612 (1894b); C.B. Clarke: 206 (1897/98). Type: Cape of Good Hope, *Drège s.n.*, possibly *Drège 3947*, Aliwal North (K).

I. humilis Kunth: 207 (1837); Steud.: 100 (1855). *B. humilis* (Kunth) C.B. Clarke: 614 (1894b); C.B. Clarke: 205 (1897/98); Schönland: 35 (1922); Gordon-Gray: 389 (1959); Podlech: 6 (1967); Hilliard: 61 (1987); Hilliard & B.L. Burtt: 114 (1987). Type: South Africa, probably *Drège* from the Cape Province but this is uncertain. Collector's number unknown.

Icones: Schönland: t. 31 (1922); Davis in Hilliard: 61 (1987).

Vouchers: *Hilliard & B.L. Burtt 14037; K.D. Huntley 7, 617; Cl. Reid 1010* (PRE); *C.J. Ward 3251, 5317.*

Description: C.B. Clarke: 206 (1897/98).

Distribution: widespread.

B. arenaria is an earlier name for the widespread, tufted, small annual 'pol-grass' better known as *B. humilis* (Kunth) C.B. Clarke.

Differs markedly from all other Natal species of genus (except its very close relatives that will be considered below). Differences are: small size (depauperate examples may not exceed 20 mm in height); usually solitary spikelets (often overtopped by hairlike leaves and bracts); tendency to amphicarpy (production of basal spikelets in leaf sheaths, thought to be the outcome of drought conditions, but this unproven). Spikelets often pallid-fawn, seldom bright reddish brown. Style branches generally two, achenes biconvex with more or less transversely wavy surface. Epidermal pericarp cells more or less square and eventually each develops a central papilla.

B. breviculmis, with three style arms and trigonous achenes, must be considered synonymous, as plants with two- and three-branched styles in the same spikelet are not uncommon.

Another variant, *B. striatella* C.B. Clarke (*Buchanan 86*, K, lectotype, designated by Lye 1983b) is, in this treatment, included within the limits of *B. arenaria*. In *B. striatella*, epidermal pericarp cells of achenes are arranged in longitudinal rows to give a striate effect. In many Natal populations, plants bearing such striated achenes occur intimately mixed with others with transversely wavy surfaces as for *B. arenaria*. *Schlechter 6445* (GRA) and

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* These species are not always regarded as distinct: extremes are obviously different: the most satisfactory features of difference are italicised. *B. densa* favours shaded situations, *B. pusilla* is often subjected to strong insolation, but there are exceptions.

Mogg 7203 (GRA), both from the Cape, show achenes of both types on single plants, but such intermediates are not yet (?) known for Natal. Schönland (1922) remarked '*B. striatella* cannot be specifically separated from *B. humilis*. They are only distinguished by the fact that in the former the nut is distinctly longitudinally striate, but intermediate forms of the nut are common.'

In tropical Africa, *B. striatella* is kept distinct at specific level (Haines & Lye 1983), whereas *B. arenaria* (*B. humilis*) seems to be known under the later name, *B. sphaerocarpha* (Boeck.) C.B. Clarke. Study on a continental basis is needed.

In Natal, *B. arenaria* (and often with it *B. striatella*) occurs commonly in shallow soil of moss mats over rocky outcrops or as a coloniser of bare soil surfaces. It seems indifferent to soil type and may become a troublesome weed of gardens and plant-pots, although easily eradicated by hand pulling.

2. **Bulbostylis boeckeleriana** (*boeckelerianus*) *(Schweinf.) Beetle* in The American Midland Naturalist 41: 458 (1949); Gordon-Gray: 352 (1959); Goetgh. & Coudijzer: 225 (1985). Syntypes: Ethiopia, Colonia Eritrea, below the summit of Lalamba, near Keren, 1 800 m, *Schweinfurth 837* (K); *Schweinfurth 1851, 1873* , not located. Note: Haines & Lye (1983) give the syntypes as *Schweinfurth 91, 92*. Figure 10B, E.

Scirpus boeckelerianus Schweinf.: 50 (1896). *S. collinus* (Kunth.) Boeck. var. *boeckeleriana* Schweinf.: 104 (1896). *Abildgaardia boeckeleriana* (Schweinf.) Lye var. *boeckeleriana* Lye: 327 (1973); R.W. Haines & Lye: 98 (1983).

B. collina; sensu C.B. Clarke: 613 (1894b) p.p.; sensu C.B. Clarke: 432 (1901/02); sensu Schönland: 36 (1922) p.p. non (Kunth) C.B. Clarke.

B. zeyheri; sensu C.B. Clarke: 612 (1894b) p.p.; sensu C.B. Clarke: 437 (1901/02) p.p. non (Boeck.) C.B. Clarke.

B. cinnamomea; sensu C.B. Clarke: 613 (1894b) p.p ; sensu C.B. Clarke: 209 (1897/98) non (Boeck.) C.B. Clarke.

Icones: R.W. Haines & Lye: figs 167, 168 (1983).

Vouchers: *K.D. Huntley 510, 511, 699; C.J. Ward 1494, 6415.*

Description: R.W. Haines & Lye: 98 (1983) as *A. boeckeleriana* var. *boeckeleriana*.

Distribution: Coast, Midlands, Zululand.

The history of *B. boeckeleriana* shows that it has been much confused with other species. Clarke did not distinguish it from the taxon now known as *B. contexta* (Nees) Bodard and cited specimens under *B. collina* (Kunth) C.B. Clarke and *B. zeyheri* (Boeck.) C.B. Clarke (Clarke 1894b, 1897/98, 1901/02). Schönland (1922) followed Clarke. Causing greater confusion was Clarke's (1897/98) citation under *B. cinnamomea* (Kunth) C.B. Clarke of specimens that were all *B. boeckeleriana*. Later, however, his citations under *B. cinnamomea* for tropical Africa were correct (Clarke 1901/02). This last species, now regarded as synonymous with *B. schoenoides* (Kunth) C.B. Clarke, is quite different from *B. boeckeleriana*.

B. boeckeleriana is not difficult to recognise. Plants are robust and coarse compared with other Natal species. Rhizome well developed, sympodial and often uniseriate. Sheath mouths obviously bearded by white hairs, also bracts of young inflorescences. Leaf blades usually short in relation to culm length and may be obsolete. Spikelets and their floral organs larger than in *B. contexta*, but size ranges overlap in part. Inflorescence usually a hemispherical head of sessile spikelets, but rayed heads or rayed solitary spikelets may be added to form an anthela, or heads may be reduced to solitary terminal spikelets (all forms are sometimes represented on a single plant).

Under tropical climates, inflorescences are more often anthelate than in Natal plants, and the plants themselves taller. In tropical Africa there is another aspect of the inflorescence, namely, a central sessile spikelet accompanied by rays carrying only solitary spikelets. This was, at first, recognised as a distinct species *B. transiens* (K. Schum.) C.B. Clarke. It has now been reduced to varietal status (Haines & Lye 1983). Such variants are not known for Natal.

In Natal, *B. boeckeleriana* is a 'dryland' sedge, plants being commonest in sandy, gravelly or rocky, more or less disturbed areas of grassland; occasionally they occupy semi-vlei areas where they are much larger and more vigorous. There is affinity with *B. parvinux* in the form of the vegetative organs (see No. 8).

3. **Bulbostylis burchellii** *(Ficalho & Hiern) C.B. Clarke* in Conspectus florae africae 5: 612 (1894b); C.B. Clarke: 210 (1897/98); Rendle: 122 (1899); C.B. Clarke: 440 (1901/02); Gordon-Gray: 317 (1959); Bodard: 73 (1963). Syntypes: N Rhodesia [Zambia]; along upper course of river Ninda, an affluent of Zambesi, on west side of high plateau, *Serpa Pinto 60, 62* (LISU). Figure 10C, F.

Fimbristylis burchellii Ficalho & Hiern: 28 (1881); K. Schum.: 125 (1895); Eyles: 315 (1916) p.p.

F. huillensis Ridl.: 154 (1884). Syntypes: Angola, *Welwitsch 6950, 6951* (BM).

F. hispidula sensu Boeck.: 27 (1871–1873) p.p., at least with respect to *Burchell 2151*.

Abildgaardia burchellii (Ficalho & Hiern) Lye: 495 (1974b); R.W. Haines & Lye: 113 (1983).

Icones: Ficalho & Hiern: t. 6B (1881); R.W. Haines & Lye: figs 205, 206 (1983).

Vouchers: *Cl. Reid 1058* (PRE); *Germishuizen 2036* (PRE); *Hitchins 271* (PRE); *Meyer s.n.* (NU 22, 898); *Tinley 87.*

Description: R.W. Haines & Lye: 113 (1983) as *A. burchellii.*

Distribution: Maputaland.

Known in Natal from Lake Sibayi (Etsheni area, NE of lake), Kosi Nature Reserve and the Ndumu and Hluhluwe Game Reserves. Frequent in Mozambique, Transvaal, northern Orange Free State, north central Cape Province and southern Botswana, also Zimbabwe.

Perennial with very fine leaves and anthelate inflorescence of brown spikelets that are small for the genus. Occasionally branching within inflorescence is reduced (not yet seen in Natal specimens). Confusion is possible with *B. contexta* (No. 4), which is sympatric, but is a more robust species; plants larger with larger spikelets and pyramidal style bases rather than rounded, flattened, button-like ones of *B. burchellii.* There has also been confusion with *B. densa* which is annual and more delicate and flexuous and favours damp, shaded situations. All three species commonly occupy sandy, well-aerated substrates.

4. **Bulbostylis contexta** *(Nees) Bodard* in Annales de la Faculté des Sciences, Université de Dakar: 77 (1963). Syntypes: South Africa, 'In collibus graminosis Adovensibus, alt. 111, *Ecklon s.n.*; in sylvis primaevis jugi Olifantshoek ad flumen Boeschmenrivier alt. 1.,' (Uitenhage), *Ecklon s.n.* Figure 10G, J.

Ficinia contexta Nees: 292 (1834b) nom. nud. *Trichelostylis contexta* Nees: 146 (1835). *Fimbristylis contexta* Kunth: 245 (1837); *Abildgaardia contexta* (Nees) Lye: 495 (1974b); R.W. Haines & Lye: 103 (1983).

Isolepis collina Kunth: 208 (1837); Steud.: 101 (1855). *Scirpus collinus* (Kunth) Boeck.: 746 (1869/70). *B. collina* (Kunth) C.B. Clarke: 613 (1894b) p.p.; C.B. Clarke: 208 (1897/98); Schönland: 36 (1922) p.p.; Gordon-Gray: 330 (1959); auct. non C.B. Clarke: 432 (1901/02). Type: South Africa, Alexandria Div., Addo, *Drège 2037* (K).

B. kirkii C.B. Clarke: 415 (1894b); C.B. Clarke: 209 (1897/98). Type: Natal, Inanda, *Wood 1576.*

B. burkei C.B. Clarke: 209 (1897/98). Syntypes: Orange Free State, Caledon River, *Burke 332*; without locality, *Zeyher 1769.*

Scirpus zeyheri Boeck.: 752 (1869/70). *B. zeyheri* (Boeck.) C.B. Clarke: 616 (1894b) p.p. ; C.B. Clarke: 209 (1897/98); auct. non C.B. Clarke: 437 (1901/02).

Icones: Schönland: t. 33 (1922); R.W. Haines & Lye: figs 179, 180 (1983).

Vouchers: (i) *Moll 4315; C.J. Ward 1986; 2000*; with patent pubescence *K.D. Huntley 731, 745; Gemmell s.n.* (in BLFU 6551). (ii) *K.D. Huntley 616; Killick 686; C.J. Ward 2084; Wells 1212, 1304, 1075A.* (iii) *Hilliard 2380*; *Johnstone 570; D.J. McDonald 120.*

Description: Gordon-Gray: 330 (1959) as *B. collina.*

Distribution: Coast, Midlands, Zululand, N Natal, Maputaland.

Extremely common in Natal. Polymorphic and difficult to treat taxonomically. Here the species is dealt with in a broad sense with extremes that differ markedly in inflorescence form, and type and extent of pubescence, not recognized infraspecifically. Seasonal growth conditions and local microhabitat appear to influence morphological form. Introgression with sympatric relatives (*B. hispidula, B. oritrephes, B. boeckeleriana* in particular) has also probably had effect in widening the range of morphological variability.

Tufted perennials with fine leaf blades with well-developed beards of long hairs at sheath mouths and on inflorescence bracts. Glumes 3.2–5.3 (4.3 ± 0.09) mm long; 2.0–4.0 (2.75 ± 0.09) mm in total width, (figures in brackets are means, ± standard deviations of the means); ovate-oblong to elliptic-oblong. Achenes 0.9–2.0 (1.31 ± 0.04) mm long (excluding style base); 0.8–1.3 (1.0 ± 0.029) mm wide. These measurements, together with the 3-angled achene carrying, temporarily, a pyramidal, 3-angled style base (0.2–0.4) mm long, are the most reliable means of distinguishing *B. contexta* from its many allies with which it has been consistently confused (*B. boeckeleriana; B. hispidula; B. burchellii; B. oritrephes* in particular).

In Natal the main expressions of morphological variability are as follows:

(i) tall tufted plants with rhizome poorly marked. Anthelas twice compound, branches bearing mostly solitary spikelets. Occurs mainly in coastal grassland usually in sand, in areas without a marked unfavourable winter period. On the south coast, in rather localised regions, are such plants but with a dense pubescence of patent, villous, slightly sticky hairs that make them distinctive (some from slightly less favourable microhabitats with unbranched heads of sessile spikelets).

(ii) tall to medium-sized plants with shoot bases often enclosed in persistent sheaths. Anthelas once compound with few rays carrying twinned, or grouped, or an occasional solitary spikelet. Pubescence may be less well marked. Occurs mainly in grassveld of coastal hinterland and lower midlands where veld-fires and some winter cold are environmental factors.

(iii) short plants with shoot bases with persistent dark sheaths and sometimes more evident rhizomes. Inflorescences are single hemispherical heads of closely packed sessile spikelets. This expression occurs mainly in exposed rocky situations or in disturbed grassveld where fires and the unfavourable winter season are severe setbacks to robust growth.

Intermediates linking these groups are frequent and varied. They may be found in the same localities as the more typical examples, but grow usually under somewhat less favourable local microhabitats.

5. **Bulbostylis densa** *(Wall. ex Roxb.) Hand.-Mazz.* in Karsten & Schenk, Vegetationsbilder 20: 16 (1930); Hara: 467 (1942); Kern: 538 (1974); T. Koyama: 324 (1985). Type: India, *Wallich 3514* (C).

Scirpus densus Wall. ex Roxb.: 231 (1820); Beetle: 464 (1949). *Isolepis densa* (Wall. ex Roxb.) Roem. & Schult.: 71 (1824); Nees: 109 (1834a).

I. trifida Nees: 108 (1834a); Kunth: 213 (1837); Steud.: 103 (1855). *B. capillaris* (L.) Kunth ex C.B. Clarke var. *trifida* (Nees) C.B. Clarke: 652 (1893/94). Type: Nepal, *Royle s.n.*.

The complex of which *B. densa* forms a part, is in need of revision on a world basis. There have been differences of opinion with regard to Old and New World plants. The African plants, together with those of India and Asia, were segregated from the American, *B. capillaris* (L.) C.B. Clarke. More recently the African plants have been recognised as distinct at varietal level from the Indian and Asian elements (under *Abildgaardia*, Lye 1983b). Subsp. *densa*, which does not occur in Natal, is a slender annual with glumes and achenes differing in small features from those of the African plants.

subsp. **afromontana** *(Lye) R.W. Haines*, The sedges and rushes of East Africa, Appendix 3: 1 (1983); Goetgh. & Coudijzer: 251 (1985). Type: Uganda, Mt Gahinga, *Lye 5329* (EA, holo.). Figure 10H, K.

Abildgaardia densa (Wall.) Lye subsp. *afromontana* Lye: 237 (1983b); R.W. Haines & Lye: 120 (1983).

B. trifida (Nees) Nelmes: 209 (1950); Nelmes: 318 (1951) (name superfluous).

B. capillaris var. *trifida* auct.; C.B. Clarke: 612 (1894b); C.B. Clarke: 210 (1897/98); C.B. Clarke: 438 (1901/02), non (Nees) C.B. Clarke.

B. densa auctt. Hilliard: 61 (1987); Hilliard & B.L. Burtt: 114 (1987) non (Wall. ex Roxb.) Hand.-Mazz.

Icones: R.W. Haines & Lye: figs 224, 225 (1983); Goetgh. & Coudijzer: fig. 8 (1985); Vanden Berghen: fig. 97 (1988).

Vouchers: *Hilliard & B.L. Burtt 12538; K.D. Huntley 732; Moll 708; C.J. Ward 9725.*

Description: R.W. Haines & Lye: 120 (1983) as *Abildgaardia densa* subsp. *afromontana.*

Distribution: Coast (south), Midlands, Uplands, N Natal. Not yet known from Zululand nor Maputaland, but present in Swaziland.

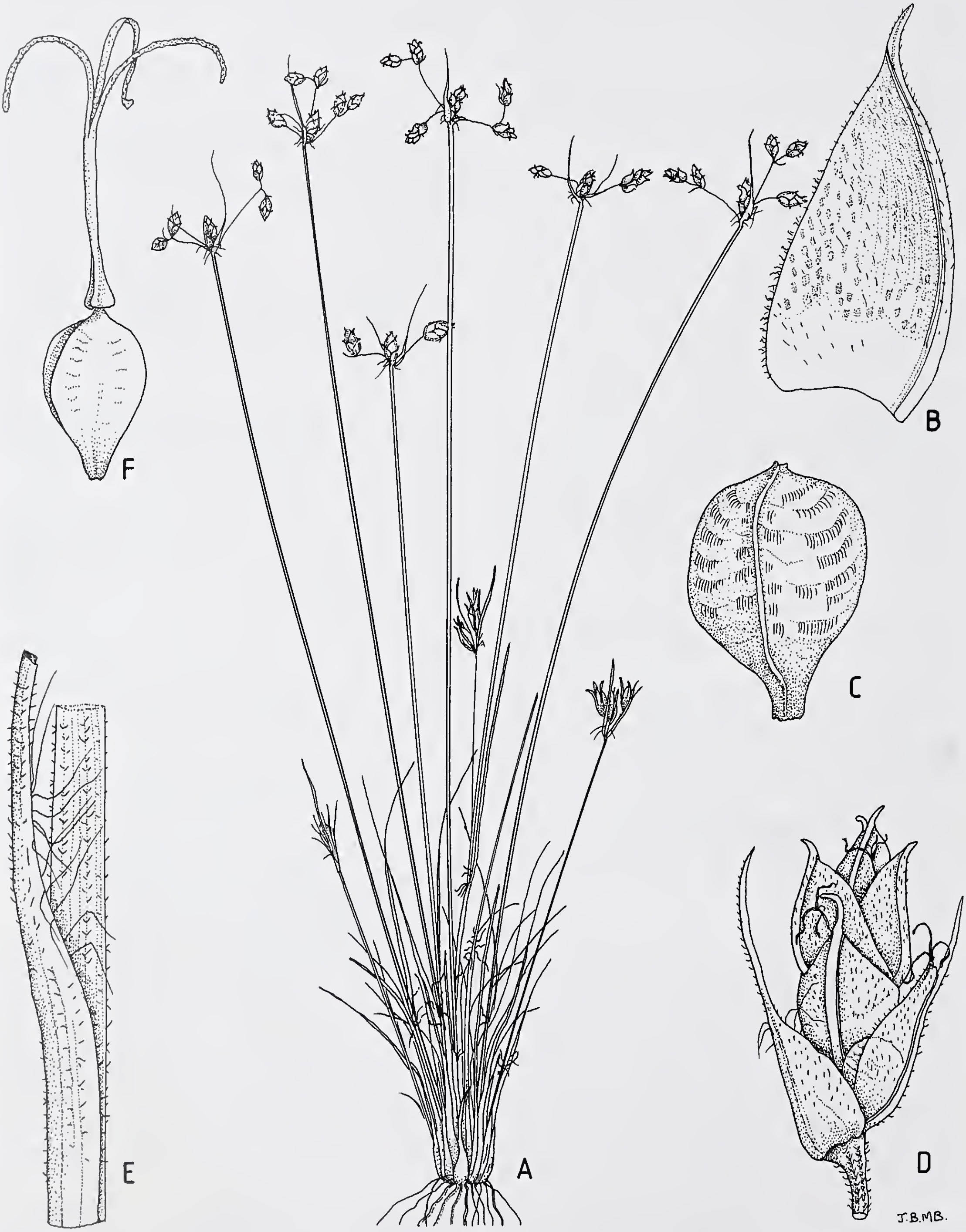

FIGURE 11.—*Bulbostylis hispidula* subsp. *pyriformis*, *Ward 610*. A, plant, × 1; B, glume, mucro not always developed, lateral view, × 29; C, achene, × 41; D, spikelet, × 4; E, mouth of leaf sheath, × 5; F, young achene, style attached, × 34.

Delicate annuals growing often on shaded soilbanks along streamlets where temporary wash of water is possible (plants then not erect); in wet sand or gravel at edges of rock, and underlying grass tufts under vlei conditions (120–2 100 m altitude). Hair-like culms and leaves and small brown spikelets with few glumes that gape to reveal punctate mature achenes are the best characters for identification.

In Ross (1972), specimens now segregated under *B. pusilla* (Hochst. ex A. Rich.) C.B. Clarke were included in *B. densa*. Goetghebeur & Coudijzer (1985) state 'The difference between *B. pusilla* and *B. densa* is not always very clear ...'. In Natal *B. pusilla* does not usually occupy shaded situations. Plants also seem smaller, but this needs verification from further field sitings (see No. 9).

6. **Bulbostylis hispidula** *(Vahl) R.W. Haines* in The sedges and rushes of East Africa, Appendix 3: 1 (1983). Type: Guinea, *Thonning 349* (C, MO, iso.).

Scirpus hispidulus Vahl: 276 (1805); Schumach.: 30 (1827). *Fimbristylis hispidula* (Vahl) Kunth: 227 (1837). *Abildgaardia hispidula* (Vahl) Lye: 496 (1974b).

Isolepis exilis Kunth: 224 (1816). *S. exilis* Willd. ex Poir.: 105 (1817). *F. exilis* (Kunth) Roem. & Schult.: 98 (1817). *B. exilis* (Kunth) Lye: 547 (1971a). Type: Venezuela, prope Cumana, *Bonpland s.n.*.

A very variable species; widespread and frequent in tropical Africa, less common in tropical America, rare in Malesia. Annual and perennial plants, some of the latter quite strongly rhizomatous, have been placed within its limits. For many years the species was accepted within *Fimbristylis* because of early shedding of the style base. However, in general facies, and in embryo type, there is relationship with *Bulbostylis* within which genus it is now placed. Many varieties and subspecies have been described. Haines & Lye (1983) for East Africa recognised six subspecies including the typical one. Considering their frequency, Natal representatives of the species are suprisingly uniform (apart from the variablility in plant size that characterises almost every annual sedge) and agree most closely with subsp. *pyriformis* (Lye) R.W. Haines.

subsp. **pyriformis** *(Lye) R.W. Haines*, The sedges and rushes of East Africa, Appendix 3: 1 (1983). Type: Uganda, Karamoja, Moroto, *R.W. Haines 4208* (MHU, holo.). Figures 10I, L; 11.

Abildgaardia hispidula (Vahl) Lye subsp. *pyriformis* (Lye) Lye: 239 (1983b). *A. hispidula* (Vahl) Lye var. *pyriformis* Lye: 494 (1974b).

Icones: R.W. Haines & Lye: fig. 190 (1983).

Vouchers: *K.D. Huntley 503; C.J. Ward 610, 755, 1672, 8759.*

Description: R.W. Haines & Lye: 107 (1983) as *A. hispidula* subsp. *pyriformis.*

Distribution: widespread, rare in Uplands.

Natal plants always annual but extremely variable in size and robustness; inflorescence varies from a simple anthela (with relatively few patent or recurved branches bearing solitary spikelets) to a head of 2–3 sessile spikelets, or to a solitary spikelet. Glumes ovate, dark to pale brown, with greenish or fawn keel sometimes excurrent into a mucro and usually with very shortly ciliate margin. Achenes at maturity, stretch glumes giving spikelets characteristically angled form. The pyriform achenes narrow into a short stipe-like base. Style base shed, either with style (as in *Fimbristylis*), or very soon after, so that at time of dispersal many achenes have a nude apex.

Plants often ruderals, frequently in sand, or as pioneers in exposed bare areas along river and vlei margins or in sparse soil over rocks. May be weeds of cultivation.

7. **Bulbostylis oritrephes** (*orytrephes*) *(Ridl.) C.B. Clarke* in Transactions of the Linnean Society of London, Ser. 2,4: 54 (1894a); C.B. Clarke: 615 (1894b); C.B. Clarke: 445 (1901/02); Gordon-Gray: 293 (1959); Goetgh. & Coudijzer: 228 (1985). Syntypes: Angola, Golongo Alto, slopes of Queta Mtns, *Welwitsch 7016, 7020* (BM). Figure 12A, D.

Fimbristylis oritrephes Ridl.: 155 (1884). *F. orytrephes* K. Schum.: 125 (1895) name only. *Abildgaardia oritrephes* (Ridl.) Lye: 497 (1974b); R.W. Haines & Lye: 101 (1983).

B. oritrephes (Ridl.) C.B. Clarke subsp. *australis* B.L. Burtt: 353 (1986); Hilliard: 61 (1987); Hilliard & B.L. Burtt: 114 (1987). Type: South Africa, Natal, Mpendhle Dist., Loteni Nature Reserve, *Hilliard & B.L. Burtt 18033* (E, holo.; NU, iso.).

B. trichobasis sensu C.B. Clarke: 445 (1901/02), excluding description; sensu Schönland: 35 (1922) non (Baker) C.B. Clarke.

Icones: Schönland: 30 (1922) as *B. trichobasis*; R.W. Haines & Lye: figs 173, 174 (1983) as *A. oritrephes.*

Vouchers: *K.D. Gordon-Gray 2007, 2010; K.D. Huntley 558; Hilliard & B.L. Burtt 15583; Killick 707, 942; C.J. Ward 1514, 1543, 7168* (familiar aspect). *Jordaan 875* (NH) (leafy form, Natal). *Britten s.n.* (GRA); *Killick & Marais 2060, 2071* (leafy form, eastern Cape).

Description: Gordon-Gray: 293 (1959).

Distribution : Coast (south), Midlands, Uplands, N Natal, Weza.

In Natal, *B. oritrephes* is conspicuous in early spring, especially in areas previously subjected to fire. Plants occur in local groups in sparse, usually dry grassland, often on stony hummocks. Identification is made easy by fine, short, dark green leaf blades (sometimes reduced to minute projections from sheath mouths) and blackish inflorescences (most often hemispherical or narrower heads of few sessile spikelets; usually accompanied on same plant by culms carrying twinned or solitary spikelets). Removed from soil, plants are also easily recognisable by uniseriate (occasionally irregular or multiseriate) rhizome composed of confluent, swollen culm bases. Glumes finely pubescent abaxially; midrib terminates in apex, or is minutely excurrent. Achenes almost round in outline, 0.9–1.3 × 0.6–1.0 mm, trigonous, with persistent vertically flattened style base, also round in outline. This is the most familiar aspect of the species.

Actually very variable: late in season, culms, now very long and hair-like, lodge among grasses and plants, when they *are* found, look different, especially as spikelets break up and later ones are not formed. Towards southern Natal (Richmond to Weza) and into the Cape are plants that, even in spring, contrast with the aspect of the species already described. These plants are densely leafy, growth form tufted but with some evidence of swollen culm bases; inflorescences are heads of 5–10 radiating, sessile spikelets usually not accompanied by culms bearing

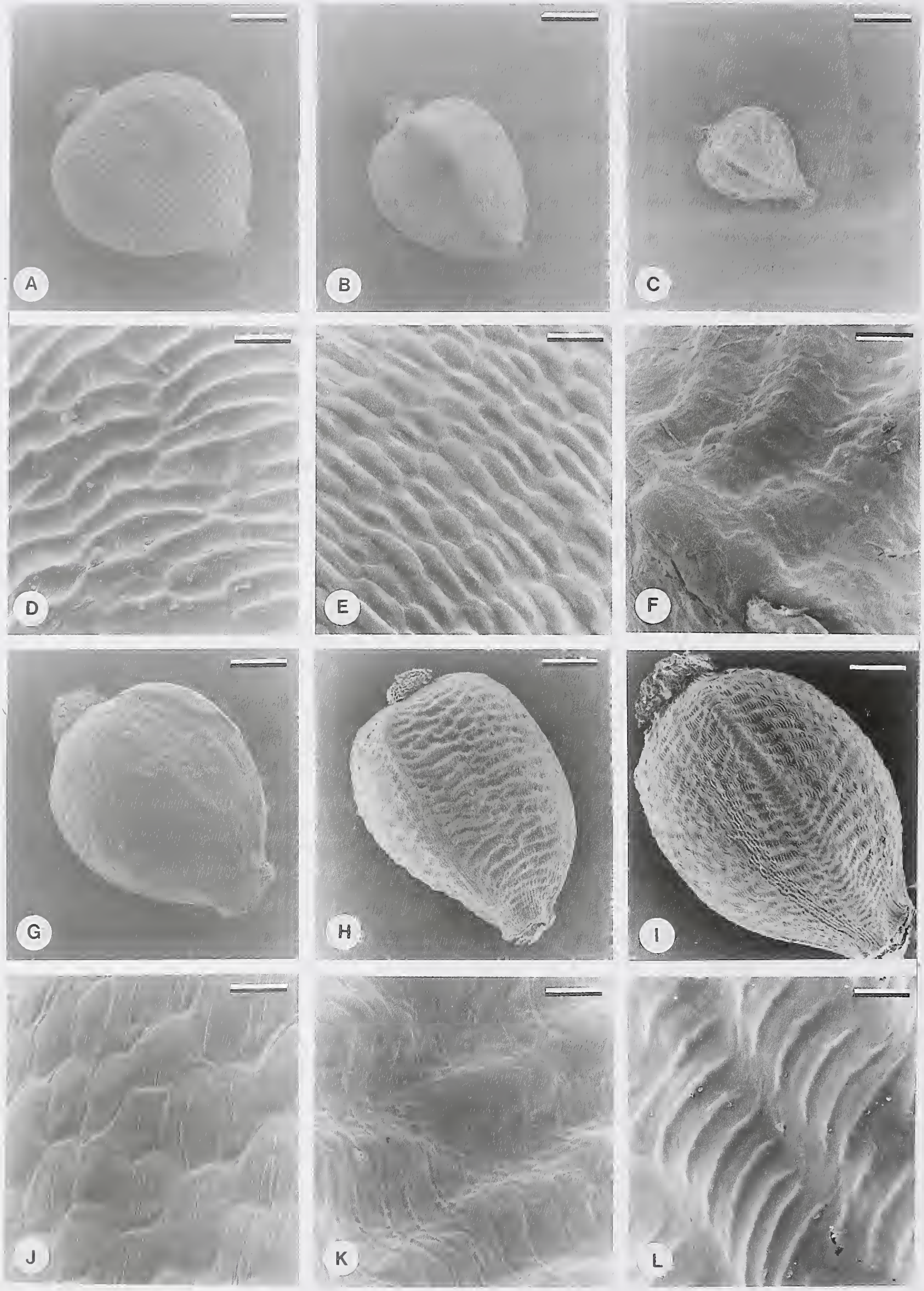

FIGURE 12.—*Bulbostylis.* A, D, *B. oritrephes, Killick 707*; B, E, *B. parvinux, Moll 4619*; C, F, *B. pusilla, K.D. Gordon-Gray s.n.*; G, J, *B. scabricaulis, McCallum-Webster s.n.*; H, K, *B. schoenoides, Killick & Marais 2159*; I, L, *B. scleropus, Huntley 570.* Scale bars: A–C, G–I, 250 µm; D–F, J–L, 25 µm.

solitary spikelets. By their glumes and achenes they belong with *B. oritrephes*, but their appearance differs markedly.

To the north, into Mozambique and the Transvaal and further north into tropical Africa, the extent of leaf blade development is often much reduced. This is accompanied by 1–4 rays (either simple, or with another order of branching, and carrying solitary or grouped spikelets) being added to the head-like inflorescences. These changes, together with the generally taller stature of the tropical plants, again brings about a differing facies for the species. There appears to be a continental gradient or gradients (?) that are likely to be influenced by local microhabitat conditions and perhaps seasonal variations.

Burtt (1986) established subsp. *australis* for plants lacking rays to the inflorescence (the majority of Natal plants), but infraspecific categories are not recognised in this treatment as there are examples that do not fall within existing infraspecific taxa. A survey covering sub-Saharan Africa would be helpful.

8. **Bulbostylis parvinux** *C.B. Clarke* in Flora capensis 7: 207 (1897/98); Gordon-Gray: 233 (1959); Bodard: 62 (1963). Type: Mozambique, Delagoa Bay, *Kuntze 217* (K, holo.). Figure 12B, E.

Abildgaardia parvinux (C.B. Clarke) Lye: 545 (1971a).

Vouchers: *Moll 4619; Tinley 433; C.J. Ward 2015.*

Description: C.B. Clarke: 207 (1897/98); Gordon-Gray: 233 (1959).

Distribution: Maputaland.

A southern African endemic species, known only from Mozambique and Maputaland. In Maputaland, a tufted perennial of sandy, white and pale red soils, amongst *Hyparrhenia* and *Perotis* (Poaceae) in *Terminalia* and *Acacia burkei* woodland, in between sand forest strips where grasses are about 0.6 m high. Vegetatively plants resemble those of *B. boeckeleriana* and have a uniseriate, quite well-marked rhizome with sheath mouths white-bearded and leaf blades usually reduced to apiculate projections of sheath keels. But spikelets in *B. boeckeleriana* rounded with spirally arranged glumes, inflorescence heads hemispherical: in *B. parvinux* spikelets flattened, glumes generally 2-ranked, inflorescences spherical with some spikelets reflexed against culm.

There is doubt as to the generic relationship of *B. parvinux*. Lye (1971a) referred it to *Abildgaardia*, but the beards developed from sheath mouths and bracts and the existence of other *Bulbostylis* spp. with distichous glumes suggest a more natural placement under *Bulbostylis* (following Goetghebeur & Coudijzer 1984, see under *Abildgaardia* p. 19). The embryo structure has not yet been studied. The information it provides may clarify the generic affinities.

9. **Bulbostylis pusilla** *(Hochst. ex A. Rich.) C.B. Clarke* in Conspectus florae africae 5: 615 (1894b); Bodard: 72 (1963); Goetgh. & Coudijzer: 246 (1985). Type: Ethiopia, *Schimper 796* (P). Figure 12C, F.

Fimbristylis pusilla Hochst. ex A. Rich.: 506 (1851). *Abildgaardia pusilla* (Hochst. ex A. Rich.) Lye: 497 (1974b); R.W. Haines & Lye: 117 (1983).

F. parva Ridl.: 153 (1884). *B. parva* (Ridl.) C.B. Clarke: 615 (1894b). *Abildgaardia parva* (Ridl.) Lye: 758 (1982a). Syntypes: Angola, *Welwitsch 6823* p.p., *6831* p.p. (BM).

Icones: Goetgh. & Coudijzer: fig. 10C, D (1985).

Vouchers: *K.D. Gordon-Gray s.n.* (Tugane River near Muden) *Pentz & Acocks 10262* (PRE).

Description: Goetgh. & Coudijzer: 246 (1985).

Distribution: Midlands, N Natal.

B. pusilla has been little collected in Natal. Small, tufted annual with narrow spikelets in anthelate inflorescence, very like *B. densa*, but smaller in all its parts and without gaping glumes, except sometimes when achenes are fully mature. Plants usually more tufted and erect than those of the flexuous *B. densa* and grow in sunlight rather than shade, in moist, mossy seeps over rock outcrops. It needs to be searched for in other parts of Natal. In Ross (1972) *B. pusilla* was not differentiated from *B. densa* (No. 5). In tropical Africa *B. pusilla* is widespread and morphologically variable. Study on a continental basis is needed.

10. **Bulbostylis scabricaulis** *Cherm.* in Bulletin Société botanique de France 68: 419 (1921); Goetgh. & Coudijzer: 233 (1985). Syntypes: Madagascar, Mevatanana, *Perrier de la Bâthie 477*; Ampombo, *Perrier de la Bâthie* 4578 (P). Figure 12G, J.

Fimbristylis collina Ridl.: 154 (1884). *Abildgaardia collina* (Ridl.) Lye: 757 (1982a); R.W. Haines & Lye: 121 (1983) non *B. collina* (Kunth) C.B. Clarke. Syntypes: Angola, *Welwitsch 7004, 7004B, 7151* (BM).

B. cardiocarpa (Ridl.) C.B. Clarke: 612 (1894b) p.p. (*Holub*, Leshumo, Zambesia only). *B. cardiocarpa* (Ridl.) C.B. Clarke var. *holubii* C.B. Clarke: 434 (1901/02). *Abildgaardia filamentosa* (Vahl) Lye var. *holubii* (C.B. Clarke) Lye: 496 (1974b). Type: Rhodesia, Zambesia, Leshumo Valley, *Holub s.n.* (coll. & comm. Dr. Em. Holub; received May, 1883, K, holo.).

B. filamentosa (Vahl) C.B. Clarke p.p. sensu C.B. Clarke: 614 (1894b), at least *Schweinfurth 1995, 3516; Whyte s.n.; Gillett 622* (all K).

Icones: R.W. Haines & Lye: figs 228, 229 (1983).

Voucher: *Barker 4355* (NBG).

Description: Goetgh. & Coudijzer: 233 (1985).

Distribution: Midlands.

A tropical species that has been collected only once in Natal (from grassveld slopes north of Pietermaritzburg). There is no doubt of its identity. It does not appear to be a variant of any other Natal species. Strangely, there is another isolated collection from Swaziland.

Identified by its perennial tufted habit, fine leaves and rather thickish culms, scabrid hairy particularly below inflorescence which is a solitary, hemispherical head of a number of closely packed, relatively small, angular spikelets.

In the remainder of Africa, the species has been much confused, particularly with *B. filamentosa* (Vahl) C.B. Clarke (which is recorded from the Transvaal, Pietersburg Dist., Houtbosch, *Rehmann 6511, 5617*, K, and from Mozambique, Moribane Dist., Macequece, *Fisher &*

Schweickerdt 447, K, NU), but the spikelets and achenes of *B. scabricaulis* and *B. filamentosa* are quite different. *B. filamentosa*, itself, has been difficult to delimit and some workers (e.g. Haines & Lye 1983) still express uncertainty concerning its distinction from *B. scabricaulis*. *B. metralis* Cherm. from Madagascar is now generally accepted as a synonym of *B. filamentosa*.

11. **Bulbostylis schoenoides** *(Kunth) C.B. Clarke* in Conspectus florae africae: 616 (1894b); C.B. Clarke: 54 (1894a); C.B. Clarke: 206 (1897/98); Gordon-Gray: 249 (1959); Bodard: 62 (1963); Podlech: 6 (1967); B.L. Burtt: 354 (1986); Hilliard: 61 (1987); Hilliard & B.L. Burtt: 114 (1987); Gordon-Gray: 565 (1988). Syntypes: Cape Province, King William's Town Div., between Yellowwood River and Zandplaat, *Drège 1040*; Stockenstrom Div., Katberg, *Drège 3936*; Aliwal North Div., Witte Bergen, *Drège 4378*. Figure 12H, K.

Isolepis schoenoides Kunth: 208 (1837); Steud.: 100 (1855). *Scirpus schoenoides* Boeck.: 745 (1869/70).

Icones: Davis in Hilliard: 61 (1987).

Vouchers: *K.D. Huntley 570; Johnstone 459, 476.*

Description: C.B. Clarke: 206 (1897/98).

Distribution: Midlands, Uplands, N Natal, Zululand; also known from Wentworth near Durban in 1898 (*Wood 12039*), but not more recently collected from altitudes lower than 600–800 m.

In this work, *B. schoenoides* is considered for Natal and the eastern Cape Province only. In these areas, plants are tufted perennials with fine leaves encased in soft, brown, non-fibrous persistent sheaths. Culms carry hemispherical heads of 4–6 fairly large sessile spikelets with glumes mid-brown or dark greyish brown or reddish black. Glumes unusual for *Bulbostylis* in that mid-vein terminates below apex which is rounded or emarginate and finely ciliate (in age cilia are lost and glume margin breaks into fingers of tissue). Unlike most *Bulbostylis* spp., long hairs of sheath mouths are sparse and soon wear away; pubescence of other parts of plant, except abaxial glume surface, is also sparse.

Plants favour wet to very damp situations in vlei to semi-vlei grassland and often where small exposed pools exist over rock surfaces.

B. schoenoides (the oldest name) forms the southernmost limit of a sub-Saharan African complex that includes the probably synonymous species, *B. cinnamomea* (Boeck.) C.B. Clarke, *B. megastachys* (Ridl.) C.B. Clarke, *B. scleropus* C.B. Clarke and *B. erratica* (Hook. f.) C.B. Clarke (see Gordon-Gray 1988). Within the complex, glume structure, achenes and features of the bisexual florets are uniform, but there is variability in inflorescence form, in the texture of vegetative parts, the development, or not, of rhizomes, and to some extent in general facies. There is difference of opinion as to how the complex is best treated taxonomically and until consensus is reached, the species are dealt with separately, which is the arrangement that has generally been followed. In Natal, *B. scleropus* is the only other taxon of the complex represented. It is treated as distinct at specific level, but this overstates the differences which are limited to what appear to be morphological responses to more extreme microhabitat conditions (see *B. scleropus* No. 12).

12. **Bulbostylis scleropus** *C.B. Clarke* in Flora capensis 7: 207 (1897/98); C.B. Clarke: 436 (1901/02); Schönland: 36 (1922); Goetgh. & Coudijzer: 225 (1985); B.L. Burtt: 354 (1986); Hilliard: 61 (1987); Hilliard & B.L. Burtt: 114 (1987). Type: Transvaal, Aapies River, *Burke s.n.* (K, lecto. designated B.L. Burtt 1986). Figure 12I, L.

Abildgaardia scleropus (C.B. Clarke) Lye: 497 (1974b).

B. grandibulbosa Kük.: 6 (1921); Bodard: 64 (1963). Type: Rhodesia (Zimbabwe), NE area, *Fries et al. 1181* (K, iso.) name superfluous (applied to large specimens).

Icones: Kük.: t. 1, fig. 5 (1921); Schönland: t. 32 (1922).

Vouchers: *K.D. Gordon-Gray 4001; Hilliard & B.L. Burtt 13803, 17125; K.D. Huntley 561, 903; Johnstone 535.*

Description: Goetgh. & Coudijzer: 225 (1985).

Distribution: Midlands, Uplands, N Natal, Zululand.

B. scleropus is interesting in view of its close relationship with *B. schoenoides*. It is an associate of *B. schoenoides* throughout its distributional area in Natal (and throughout the remainder of sub-Saharan Africa as far as is known) but always from slightly less favourable (apparently drier and more markedly fire affected) microhabitats, often only a metre, or less, away from plants of *B. schoenoides*.

Robust plants with coarser, wider leaves, stouter culms and dark brown, broad, persistent leaf sheaths that do not readily fragment into fibres are placed with *B. scleropus*. But there are intermediates that are difficult to place and in some few field localities such intermediates represent gradients that effectively link the extremes. Most significant in the relationship of these species is the uniformity of reproductive structures (note achenes in Figure 12.: size differences in fruits occur in a majority, if not all species). Glumes also closely alike and differ from those of most other species. In *B. scleropus* glume apices fragment readily and earlier than in *B. schoenoides*. There is also reduced pubescence of whole plants of both species; this is especially noticeable in the long hairs of sheath mouth (these hairs sparse, even before there has been opportunity for them to wither and break away).

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Carex *L.*, Species plantarum edn 1: 972 (1753); L.: 280 (1754); C.B. Clarke: 299 (1897/98); C.B. Clarke: 514 (1901/02); Schönland: 68 (1922); R.A. Dyer: 890 (1976); R.W. Haines & Lye: 368 (1983). *Type species: Goetgh. (Wilson & Goetgebeur 1989) states '*non designatus*'. Tucker (1987) accepts *C. hirta* L.; Koyama (1985) lists *C. acuta* L.

Note: *Carex* in southern Africa is under revision by Cl. Reid, (NBI, Pretoria). The present treatment is a tentative guide to the identification of the species in Natal.

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* See addendum.

Natal species of the genus lack a rachilla within the utricle (see Figure 70B). In this work, it is on this criterion that the genus is differentiated from *Schoenoxiphium* Nees.

Key to species

1a Inflorescence dense, terminal pseudospike 30–50 mm long. Culms nodeless between base and inflorescence . . . . 4. *C. glomerabilis*
1b Inflorescence composed of more than one sessile spike, or with well-developed branches. Culms with nodes; if very short then overtopped by numerous leaves 2

2a Culms erect, seldom longer than 30 mm, often overtopped by numerous leaves up to 100 mm high (Drakensberg summit plateau only) . . . . 5. *C. monotropa*
2b Culms erect or drooping, usually far longer than 30 mm (coast to Drakensberg, in riverine, forest, or shaded, situations under cliffs and among boulders) 3

3a Inflorescence of branched partial inflorescences collectively forming continuous or interrupted 'panicle'. Plants usually in shaded situations under cliffs, among boulders, or in glades in forests or plantations 4
3b Inflorescence of few to many tassel-like spikes, sessile or peduncled, erect or drooping. Riverine, or fringing vleis; occasionally in forest 5

4a Utricle 3.5–4.0 × 1.0–1.25 mm with beak terminating in two slightly divergent acute to acuminate tips. Persistent style of achene not longer than 1.0 mm . . . . 7. *C. spicato-paniculata*
4b Utricle 4.5–5.0 × 1.5–2.3 mm with straight beak (tips not divergent). Persistent style of achene generally 2.0 mm long . . . 9. *C. zuluensis*

5a Inflorescence with majority of spikes erect, sessile, subsessile or very shortly peduncled. The lowermost may have an evident peduncle and may droop slightly; it is sometimes distant from the apical group 6
5b Inflorescence with majority of spikes pendulous from well-developed peduncles (avoid very young examples) 8

6a Female spikes 40–80 mm long; fine in texture with utricles and subtending glumes close-packed; often dark blackish brown. Male spikes usually 2–3 clustered apically . . . . 1. *C. acutiformis*
6b Female spikes usually not longer than 50 mm (sometimes to 70 mm); coarse in texture with utricles and subtending glumes rather loosely packed, becoming almost patent at maturity; pale straw colour to chestnut-brown. Male spike generally one, terminal 7

7a Beak of utricle (including divergent tips) usually not longer than 1.5 mm. Utricle inflated at maturity, faintly longitudinally veined abaxially. Not yet known from Natal, but in mountainous areas of Lesotho and eastern Cape . . . . 8. *C. subinflata*
7b Beak of utricle (including divergent tips) usually 1.7–1.8 mm long. Utricle not obviously inflated at maturity, strongly longitudinally veined abaxially. Widespread in Natal but seldom in extensive stands . . . . 3. *C. cognata*

8a Style branches 2. Utricle biconvex. Spikes up to about 70 mm long. Mature achene (not utricle) about 2.0 mm long . . . . 2. *C. austro-africana*
8b Style branches 3. Utricle indistinctly trigonous. Spikes up to 80 mm long, reaching 100–150 mm in age. Mature achene (not utricle) about 1.5 mm long . . . . 6. *C. mossii*

1. **Carex acutiformis** *Ehrh.* in Beiträge zur Naturkunde 4: 43 (1789); Kunth: 487 (1837); Boeck.: 289 (1877); C.B. Clarke: 307 (1897/98); R.W. Haines & Lye: 378 (1983); Hilliard: 64 (1987); Hilliard & B.L. Burtt: 116 (1987). Type: from Europe. Figure 13A–C.

C. paludosa auct. non Gooden., Kunth: 487 (1837).

Icones: R.W. Haines & Lye: fig. 780 (1983).

Vouchers: *J. Browning 245; Downing 175, 258; Edwards 2160; Johnstone 483; Moll 1381, 2436; C.J. Ward 6965.*

Description: C.B. Clarke: 307 (1897/98).

Distribution: Midlands, Uplands, S Natal (Kokstad), N Natal.

Rhizomatous, glaucous perennials usually rooted in water, often forming dense stands along margins of streamlets in forest where shade is quite intense. Densely flowered, fairly smooth, dark-coloured, erect sessile or subsessile female spikes are a reliable means of identification. Style branch number predominantly 3, but florets with only 2 branches (but trigonous achenes) may occur interspersed. When fresh, stigmas are light-coloured and show up against dark utricles, but darken with drying.

C. acutiformis is well represented in Britain and Europe. Clarke (1897/98) reported 'The S African plant differs a little from the European in having the female glumes much more aristate, the utricles nearly or quite beakless, the nut broader than long and very truncate.'

*2. **Carex austro-africana** *(Kük.) Raymond* in Bulletin de recherches, observations et decouvertes se rapportant a l'histoire naturelle du Canada, Quebec 91: 126 (1964); Hilliard & B.L. Burtt: 116 (1987). Figure 13D–F.

C. cernua Boott var. *austro-africana* Kük.: 354 (1909); Schönland: 69, 70 (1922).

C. phacota sensu C.B. Clarke: 302 (1987/98) non Spreng. Syntypes: Transvaal, Pretoria, *Rehmann 4039*; Orange Free State, Nelson's Kop, *Cooper 909, 3335*; Natal, *Wood 4038*; Cape, *MacOwan 1690.*

Icones: Schönland: t. 80 (1922) as *C. cernua* Boott var. *austro-africana* Kük.

Vouchers: *J. Browning 255; Downing 245; K. D. Huntley 383; Moll 1179, 2444; Schelpe 884; Taylor 39; C. J. Ward 638.*

Description: C.B. Clarke: 302 (1897/98) as *C. phacota* non Spreng.

Distribution: Midlands, Uplands, S Natal (Kokstad).

Leafy, rhizomatous perennials mostly under 1 m high, growing in wet areas of vleis and streamlets, sometimes on hummocks, but often rooted in shallow slowly flowing water. Occasionally they fringe *Typha* (bulrush) reedbeds in deeper water.

Identification is easiest by means of the two-branched styles of the female florets that extend beyond the short-

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* See addendum.

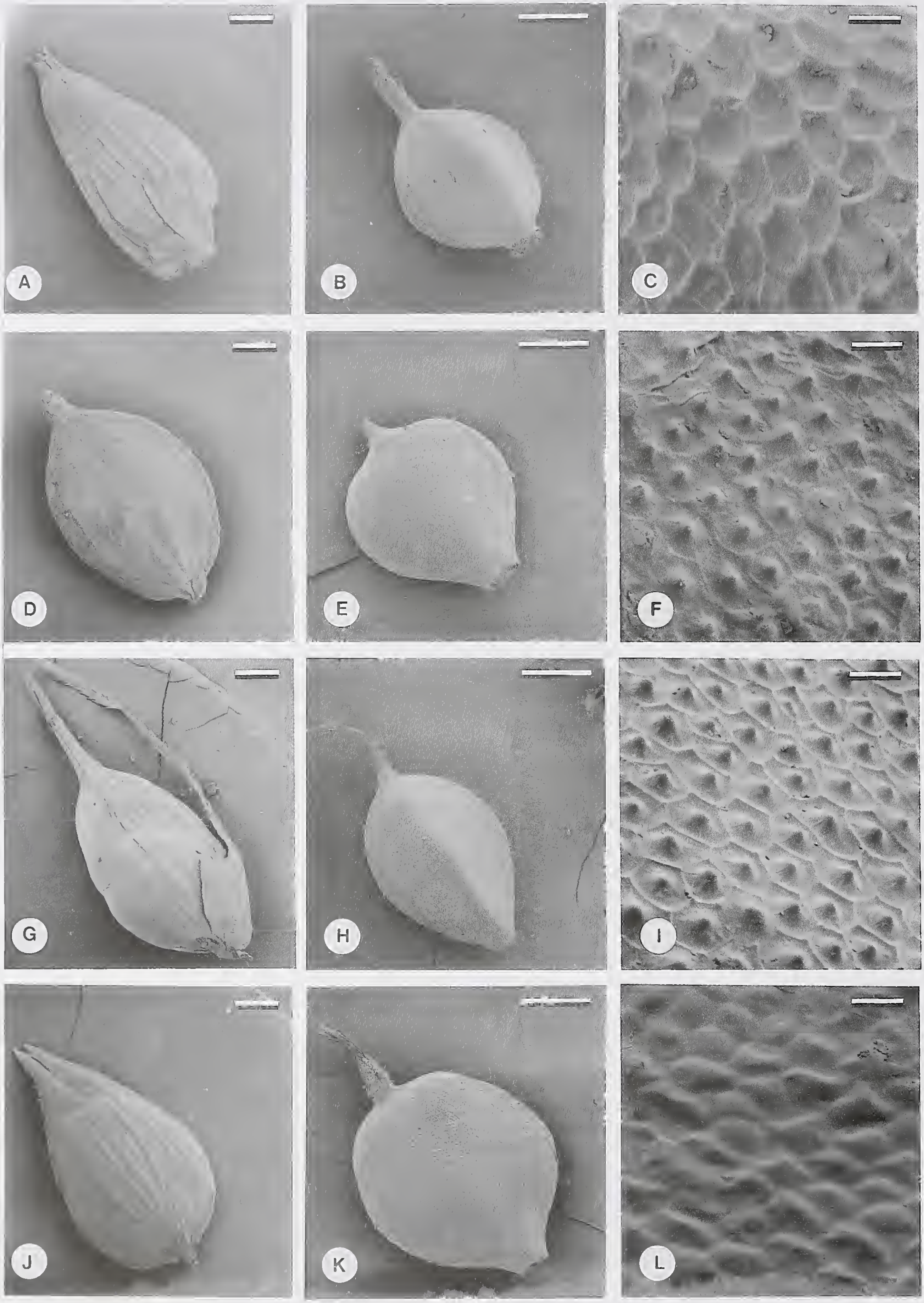

FIGURE 13.—*Carex*. A–C, *C. acutiformis*, *J. Browning 245*; D–F, *C. austro-africana*, *J. Browning 255*; G–I, *C. cognata*, *J. Browning 256*; J–L, *C. glomerabilis*, *Taylor 20A*. Scale bars: A, B, D, E, G, H, J, K, 500 µm; C, F, I, L, 25 µm.

beaked, dorsally compressed, biconvex utricles. No other Natal tasselled species has styles that are consistently two-branched. Utricle surface lacks strongly marked nerves; beak mouth truncate with two minute lateral projections that soon wither and disappear. Glumes of both male and female florets are rather characteristic with central tissue of mid-nerve prolonged into scabrid-margined, tapering apiculus and apices of flanks membranous and truncate-rounded. Spikes usually 5–6 per culm, each pedunculate and drooping.

3. **Carex cognata** *Kunth*, Enumeratio plantarum 2: 502 (1837); Schönland: 69 (1922); R.W. Haines & Lye: 384 (1983). Type: South Africa, In districtu 'Zwellendam et George', *Mund*. Figures 13G–I; 14.

C. drakensbergensis C.B. Clarke: 309 (1897/98). *C. cognata* Kunth var. *drakensbergensis* (C.B. Clarke) Kük.: 699 (1909); Schönland: 69 (1922); Hilliard: 64 (1987); Hilliard & B.L. Burtt: 116 (1987). Syntypes: Orange Free State, Drakensberg, near Harrismith, *Buchanan 112* (K); Transvaal, Mooi River near Potchefstroom, *Nelson 72* (K); Natal, Harrismith, *Buchanan 136, 137* (not located).

Icones: Davis in Hilliard: 64 (1987) (Note: the spikes are not always as long pedunculate and drooping as those illustrated. At the coast the spikes are usually subsessile and almost erect).

Vouchers: *J. Browning 256; K.D. Gordon-Gray 5013; Guy & Ward 69; Killick 991; C.J. Ward 716, 1221, 3244, 8094.*

Description: C.B. Clarke: 309 (1897/98) as *C. drakensbergensis.*

Distribution: widespread.

Tufted, rhizomatous perennials usually ranging from 0.5–0.75 m in height. Favoured habitats are open vleis and riverine situations where underground organs are kept permanently wet. Dense stands are not as common as in most other of the Natal tasselled types, and there is a preference for higher light intensities than is usual for many of the Natal taxa. Leaf blades show conspicuous transverse venation, but this may not be reliable diagnostically.

Inflorescences consist of 4–5 subsessile spikes clustered towards apex of culm with one that is shortly peduncled a short distance below. Each spike seldom exceeds 50 mm (sometimes to 70 mm) and is coarse and spiky due to two rather long slightly divergent projections that terminate long beak of each utricle. Spikes often pale straw colour, but chestnut-brown examples occur.

The species is known as far north as Tanzania but is more common in southeast tropical Africa. R.W. Haines & Lye (1983) comment upon the variability in size of the glumes and utricles.

4. **Carex glomerabilis** *V.I. Krecz.*, Notulae systematicae ex herbario instituti botanici nomine V.L. Komarovi academiae scientiarum URSS 7: 34 (1937); Hilliard: 65 (1987); Hilliard & B.L. Burtt: 116 (1987). Type: Cape, without precise locality, *Thunberg s.n.* (UPS, holo.). Figure 13J—L.

C. glomerata Thunb.: 14 (1794); Nees: 534 (1832); Kunth: 384 (1837); C.B. Clarke: 301 (1897/98).

C. schlechteri Nelmes: 269 (1940c). Type: eastern Cape Province; Transkei, in wet places near Bashee, 1 600 m, *Schlechter 6286*.

C. vulpina sensu C.B. Clarke: 301 (1897/98) non L.; Kük.: 168 (1909); Schönland: 69 (1922).

Icones: Kük.: fig. 27A–C (1909); Schönland: 78 (1922) as *C. vulpina*; Davis in Hilliard: 65 (1987).

Vouchers: *Hilliard & B.L. Burtt 9674, 19026; Taylor 20A, 41, 55.*

Description: C.B. Clarke: 301 (1897/98) as *C. glomerata.*

Distribution: Uplands (Drakensberg only); S Natal (Franklin, Mount Currie).

Robust perennials with strong, elongate rhizomes and well-developed, rather glaucous leaves up to 0.5–0.75 m high. Often form stands in dryish, damp, rough grassland, or border vlei margins that abut on water. Occasionally grow in permanent water on fringes of *Typha* reedbeds.

Culms, without nodes between base and inflorescence, each carry a single dense straw-coloured to mid-brown pseudospike, 30–50 mm long. Limited distribution in Natal, being more frequent in coastal districts of Cape.

5. **Carex monotropa** *Nelmes* in Kew Bulletin 1955: 86 (1955a); Hilliard: 64 (1987); Hilliard & B.L. Burtt: 116 (1987). Syntypes: Lesotho, Mont-aux-Sources, 2 850 m, *Flanagan 2013* (K); between Indumeni Dome and Castle Buttress, 2 910 m, *Killick 1847* (K, NU, PRE). Figure 15A--C.

Voucher: *Hilliard & B.L. Burtt 9669.*

Description: Nelmes: 86 (1955a).

Distribution: Uplands (Drakensberg summit plateau only).

Dwarf, tufted, rhizomatous perennials with culms often hidden amongst taller leaves. Inflorescence consists of 3–4 dense spikes clustered about culm apex; females more or less globose, 4–7 mm in diameter; usually solitary, terminal male, cylindric, 1.0–1.5 mm wide and slightly longer than female. Utricles at maturity yellow and strongly nerved, each with a well-developed beak 1.25–1.50 mm long. These features, together with the isolated locale, make the species easy to recognise. Plants grow in wet, turf-like vegetation or in bare gravel patches.

Nelmes (1955a) stated that, in his opinion, the closest relative of *C. monotropa* was the European *C. flava* L.

6. **Carex mossii** *Nelmes* in Kew Bulletin 1940: 137 (1940a). Type: eastern Cape Province, Hogsback, *Moss 999* (K, holo.). Figure 15D—F.

Vouchers: *T.H. Arnold 60; Moll 2887; Schelpe 205, 1495.*

Description: Nelmes: 137 (1940a).

Distribution: Midlands, Uplands, S Natal (Weza).

Leafy, rhizomatous perennials favouring wet, riverine, shaded situations often in forest. Inflorescence, consisting of 7–9 peduncled, drooping spikes produced successively along culm, distinguishes the species from all others in Natal except *C. austro-africana*, which has consistently 2-branched styles, whereas those of *C. mossii* are 3-branched. Spikes in *C. mossii* elongate markedly with maturity, attaining lengths of 120–150 mm. There is close relationship with the more tropical *C. bequaertii* De Wild.

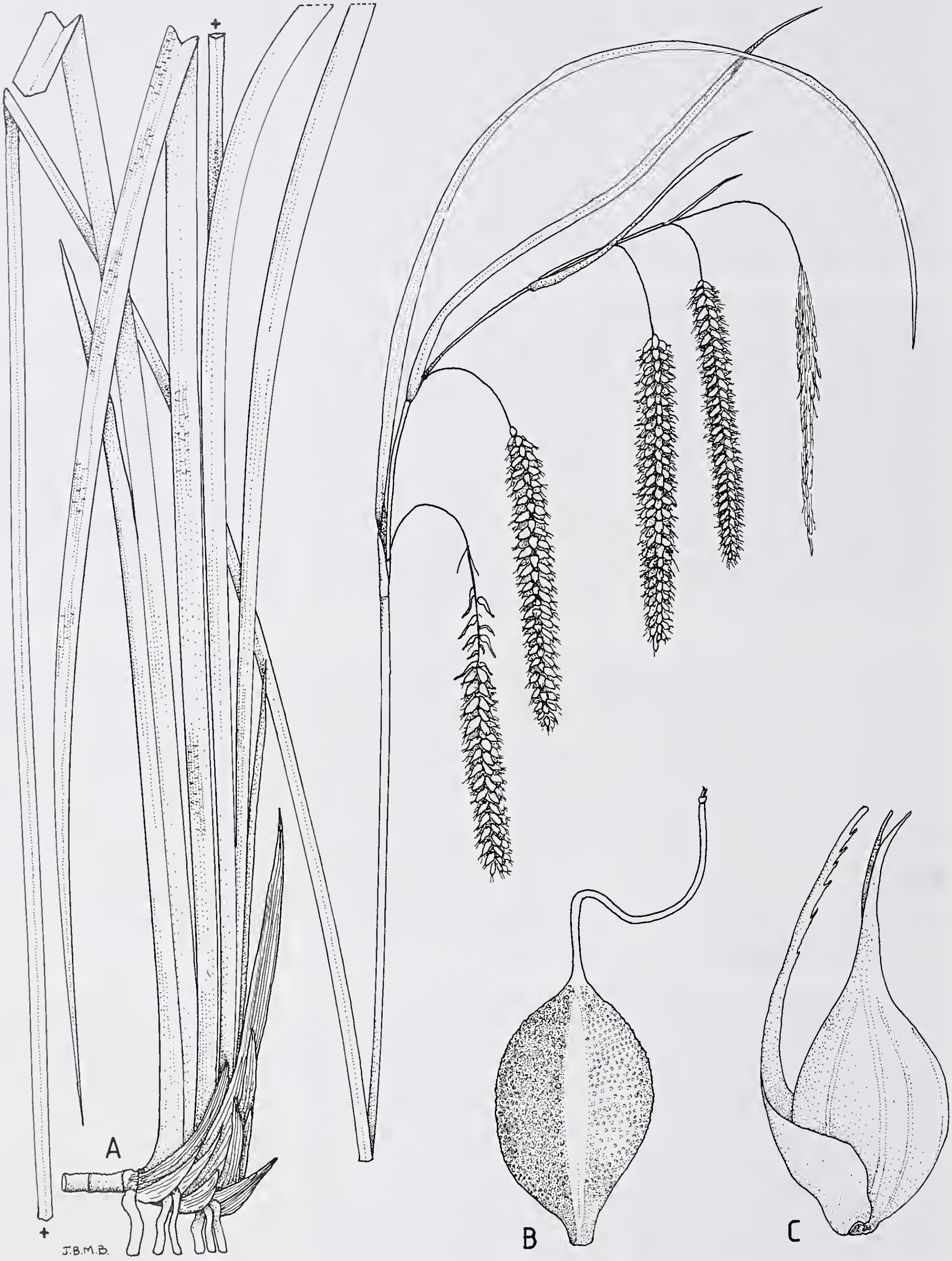

FIGURE 14.—*Carex cognata, J. Browning 256.* A, plant: in examples from the coast spikes subsessile and almost erect, × 1; B, achene with utricle removed: 3 style branches already shrivelled, × 25; C, glume and utricle, × 15.

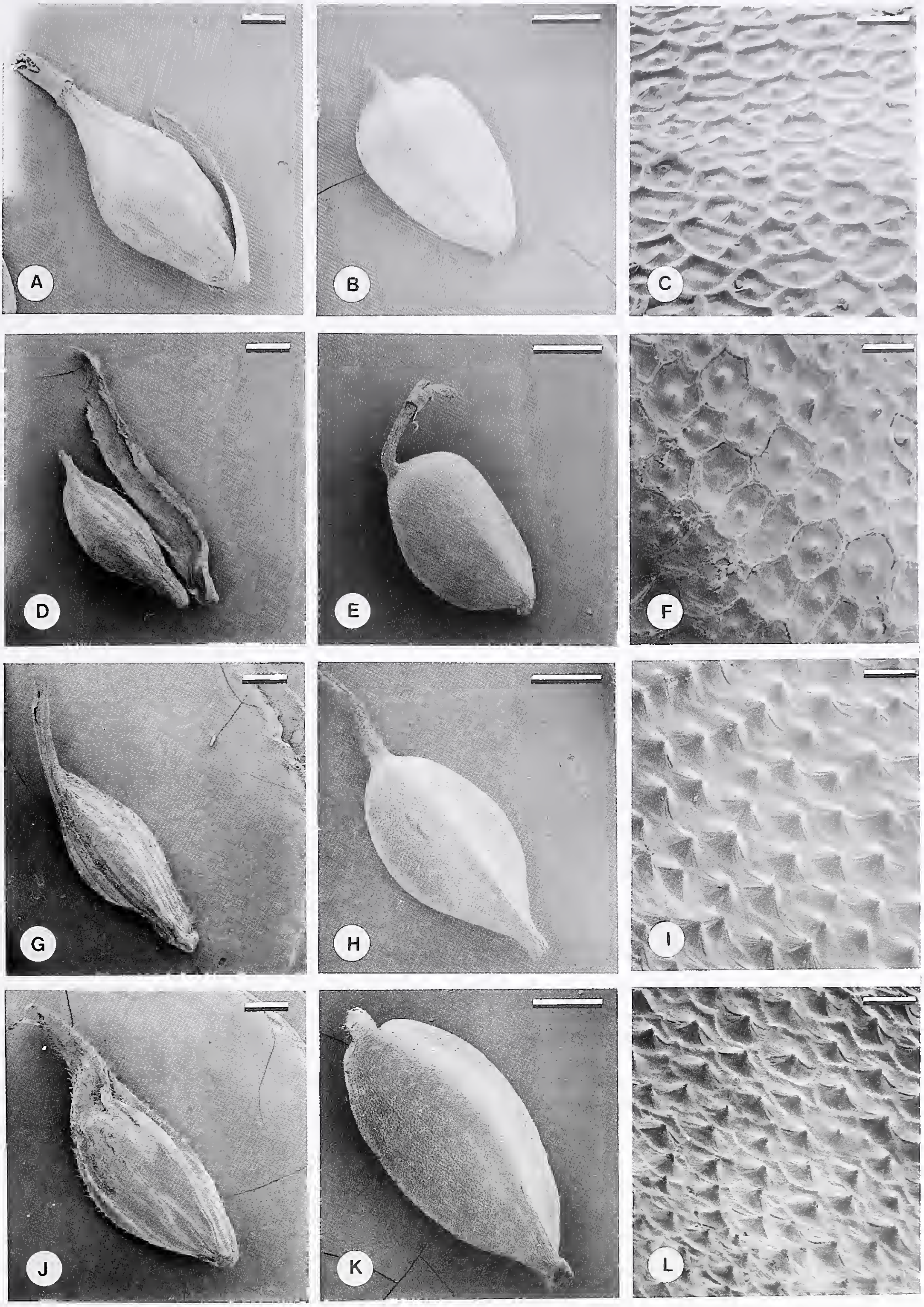

FIGURE 15.—*Carex*. A–C, *C. monotropa*, *Hilliard & B.L. Burtt 9669*; D–F, *C. mossii*, *Wirminghaus 909*; G–I, *C. spicato-paniculata*, *Hilliard & B.L. Burtt 14497*; J–L, *C. zuluensis*, *Hilliard & B.L. Burtt 16271*. Scale bars: A, B, D, E, G, H, J, K, 500 µm; C, F, I, L, 25 µm.

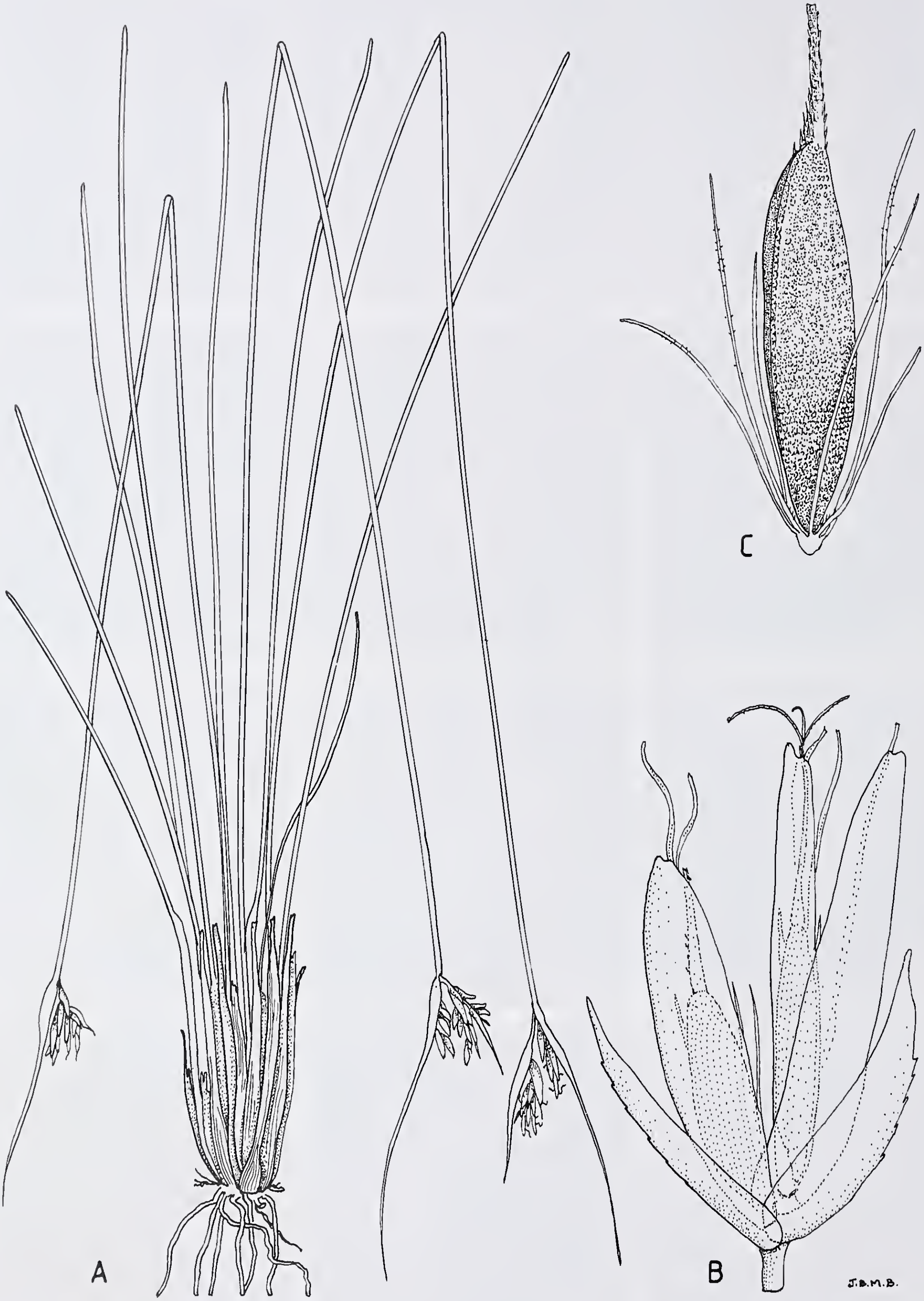

FIGURE 16.—*Carpha filifolia, Schwabe 0171.* A, plant, × 1; B, spikelet with glumes displaced to show florets with almost mature achenes, × 12; C, achene with six bristles, × 18.

7. **Carex spicato-paniculata** *Boeck. ex C.B. Clarke* in Conspectus florae africae V: 690 (1894b); C.B. Clarke: 304 (1897/98); R.W. Haines & Lye: 374 (1983); Hilliard: 65 (1987). Type: South Africa, Natal, Inanda, *Wood 1190* (K, lecto., designated Nelmes: 160 (1940b). Figure 15G–I.

Icones: R.W. Haines & Lye: fig. 771 (1983).

Vouchers: *Hilliard & B.L. Burtt 14497; Killick 303; Moll 1788; Tinley 727; C.J. Ward 8739.*

Description: C.B. Clarke: 304 (1897/98).

Distribution: Midlands, Uplands, N Natal, S Natal (Weza).

Rather slender, leafy, perennial plants grow in damp situations between boulders among scattered shrubs, or as undergrowth in forest; also frequent in plantations where edaphic conditions may be relatively dry. Much-branched paniculate inflorescence distinctive when carefully observed, but this species has been much confused with *C. zuluensis*, which favours the same general habitats, and with *Schoenoxiphium rufum* and its close ally, *S. ludwigii*. Utricles must be measured to distinguish them from those of *C. zuluensis* (see key) and dissected to establish the absence of a rachilla within (present in *S. rufum*).

*8. **Carex subinflata** *Nelmes* in Kew Bulletin 1940: 270 (1940c). Type: eastern Cape Province, Doodman's Krans Mountain, 2 600 m, *Galpin 6882* (K).

Vouchers: *Hilliard & B.L. Burtt 12125* (Lesotho, Bushmen's Pass); *Hilliard & B.L. Burtt 16512, 16652* (eastern Cape: Barkly East, Rhodes).

Description: Nelmes: 270 (1940c).

This species has not yet been recorded for Natal, but it should be looked for, particularly on the southern Drakensberg (Uplands) and perhaps in the Kokstad (Mount Currie) area.

Plants similar to those of *Carex cognata*, but there are floristic differences in the shorter spikes (to 45 mm) and in the subinflated, faintly-veined utricles each with a beak only about 1.0–1.5 mm long (usually 1.7–1.8 mm in *C. cognata*).

9. **Carex zuluensis** *C.B. Clarke* in Kew Bulletin, Additional Series 8: 74 (1908); Schönland: 69, 70 (1922); Hilliard: 65 (1987); Hilliard & B.L. Burtt: 116 (1987). Syntypes: Natal, *Buchanan 149, 353* (NH) (actually *C. spicato-paniculata*); Orange River Colony, *Buchanan 150*; Zululand, *Wood 7540*; Transkei, Tembuland, *Baur 444, 1156*. Figure 15J–L.

C. condensata sensu C.B. Clarke: 305 (1897/98) non Nees; C.B. Clarke: 521 (1901/02) non Nees.

Icones: Schönland: fig. 79 (1922); Davis in Hilliard: 65 (1987).

Vouchers: *Edwards 2331; Hilliard & B.L. Burtt 16271; Moll 1397; Strey 6265; C.J. Ward 637, 5044, 7198, 10156.*

Description: C.B. Clarke: 74 (1908).

Distribution: Coast, Midlands, Uplands, N Natal, Zululand.

Not known from Maputaland, but frequent elsewhere in Natal. Robust, rhizomatous perennials grow amongst shrubs ecotonal between grassland and early forest, often on steep east- and south-facing slopes. Also well represented in forests and plantations, in shade.

Dissection of the flattened, elliptic, distally scabrid utricles is essential if confusion with *C. spicato-paniculata* and species of *Schoenoxiphium* is to be avoided (see No. 7, *C. spicato-paniculata* and key to *Carex* spp.).

0456000 CARPHA

Carpha *Banks & Sol. ex R. Br.*, Prodromus florae novae hollandiae et insulae Van-Diemen: 230 (1810); C.B. Clarke: 269 (1897/98); Schönland: 55 (1922); R.A. Dyer: 881 (1976); R.W. Haines & Lye: 321 (1983). Type species: *C. alpina* R. Br.

Asterochaete Nees: 300 (1834b); Levyns: 119 (1950).

Key to species

1a Plants rhizomatous. Leaves dorsiventrally flattened, keeled, 15–28 mm wide, margins scabrid. Culms many-noded (1–2 nodes sterile; 2–6 fertile). Achene 2.3–2.6 mm long . . 2. *C. glomerata*
1b Plants tufted. Leaves filiform, more or less terete, 0.5–0.75 mm in diameter. Culms single-noded, rarely nodeless. Achene 4–5 mm long . . . . 1. *C. filifolia*

*1. **Carpha filifolia** *Cl. Reid & T.H. Arnold* in Bothalia 15: 139 (1984); Hilliard: 52 (1987); Hilliard & B.L. Burtt: 113 (1987). Type: Natal, Mpendhle Dist., 'Storm Heights', *Hilliard & B.L. Burtt 11791* (PRE, holo.; E, NU, iso.). Figures 16; 17A, C.

Icones: Cl. Reid & T.H. Arnold: figs 2a–h; 3; 4a (1984); Davis in Hilliard: 52 (1987); Hilliard & B.L. Burtt: t. 9c (1987).

Vouchers: *Hilliard & B.L. Burtt 9788, 11791, 16098, 16258, 14946; Killick & Vahrmeijer 3595; Schwabe 0171.*

Description: Cl. Reid & T.H. Arnold: 139 (1984).

Distribution: Uplands.

C. filifolia differs markedly from the only other species of *Carpha* recorded for Natal. Its tufted growth form, smaller habit, filiform leaves, few-noded culms and reduced inflorescence give plants something of the general facies of *Tetraria cuspidata*. There is little similarity in facies with *C. glomerata*. Other more detailed differences are longer achenes and style bases and presence of plumose bristles (sometimes lacking).

Plants grow along streambanks, in marshes and on wet cliffs, always associated with sandstone or basalt, and may be dominant. Towards end of growing season leaves and culms become conspicuously yellowish green. Also known from eastern Cape, Lesotho, Orange Free State and Transvaal.

2. **Carpha glomerata** *(Thunb.) Nees* in Linnaea 7: 529 (1832): C.B. Clarke: 269 (1897/98); Schönland: 56 (1922); Cl. Reid & T.H. Arnold: 139 (1984). Type: South Africa, near Cape Town, *Thunberg*. Figure 17B, D.

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* See addendum.

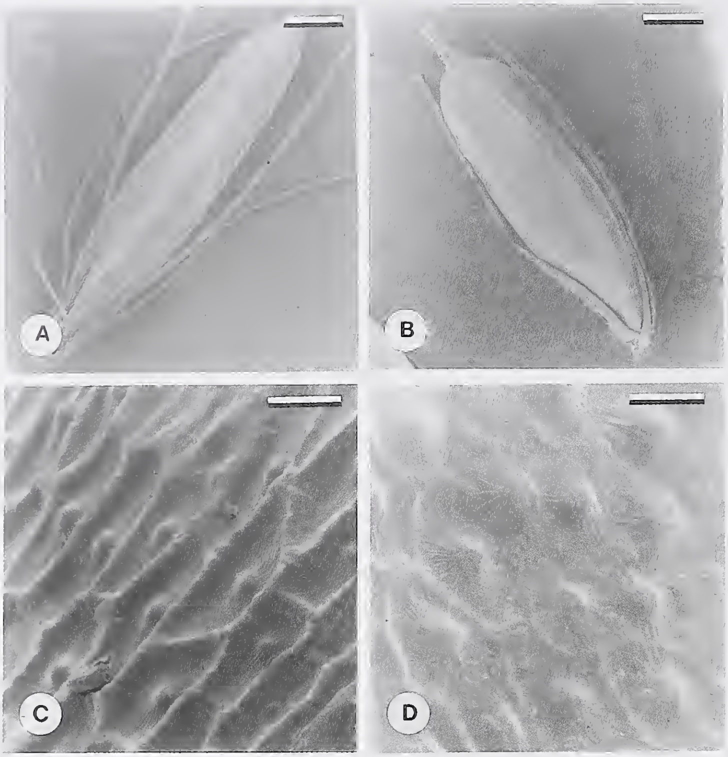

FIGURE 17.—*Carpha*. A, C, *C. filifolia, Hilliard & B.L. Burtt 11791*; B, D, *C. glomerata, Strey 7738*. Scale bars: A, B, 500 µm; C, D, 25 µm.

Schoenus glomeratus Thunb.: 17 (1794); Thunb.: 94 (1807). *Asterochaete glomerata* Nees: 300 (1834b); Nees: 194 (1835) exclud. var. B; Kunth: 311 (1837); Levyns: 119 (1950).

S. dactyloides Vahl: 224 (1805).

Icones: C.B. Clarke: t. 76, figs 7–9 (1909); Marloth: IV, t. 10E and fig. 7, 1–4 (1932); Schönland: 60 (1922); Cl. Reid & T.H. Arnold: figs 2d, 4a (1984); R.W. Haines & Lye: fig. 665 (1983).

Vouchers: *J. Browning 219; Rudatis 661; Strey 7738, 8817; C.J. Ward 7196.*

Description: C.B. Clarke: 269 (1897/98).

Distribution: Coast, not known north of Durban.

One of tallest of Natal sedges, 1.5–2.1 m high, often conspicuous above shorter vegetation along river margins or in water of pans. Robust triangular, several-noded culms bearing wide leaves and paniculate inflorescences of densely aggregated, small spikelets make identification easy. Most likely to be confused with equally tall and robust *Rhynchospora corymbosa* that is also coastal in distribution, but which has very much longer spikelets and therefore a much more 'spiky' inflorescence.

0489000 CLADIUM

Cladium *P. Browne*, The civil and natural history of Jamaica in three parts: 114 (1756); C.B. Clarke: 291 (1897/98); C.B. Clarke: 484 (1901/02); R.A. Dyer: 887 (1976); R.W. Haines & Lye: 323 (1983); Vanden Berghen: 164 (1988). Type species: *C. jamaicense* Crantz [see note by Britton: 17 (1907)].

Cladium is now considered a small genus of two or three species (Tucker 1987). *C. mariscoides* (Muhl.) Torrey, is restricted to the New World (Canada, N America). The other two are sometimes regarded as synonymous: distribution is then widespread in tidal marshes and coastal wetlands near sea to far inland, throughout most of the world. In the stricter sense, *C. jamaicense* Crantz is the American 'saw-grass' or 'twig-rush' of the Florida Everglades, whereas *C. mariscus* (L.) Pohl is the Eurasian species; culms and leaves used in the manufacture of paper in Romania and in Danube delta.

Kükenthal (1942) published a worldwide revision of *Cladium* in the broad sense (as circumscribed by Bentham 1883). These wide limits were soon found untenable and genera (for example *Machaerina* Vahl) were segregated and closely aligned with taxa other than *Cladium*. In his revision, Kükenthal referred the southern African plants to *Cladium mariscus* (L.) Pohl subsp. *jamaicense* (Crantz) Kük. This arrangement has generally been maintained for the African plants since they possess features associating them with both the American *C. jamaicense* (fruit size and shape) and the European plants (spikelet size; anther connective prolonged).

1. **Cladium mariscus** *(L.) Pohl* subsp. **jamaicense** *(Crantz) Kük.* in Feddes Repertorium Beihefte 40, part 1.6: 523 (1936/37); Kük.: 189 (1942); R.W. Haines & Lye: 323 (1983); Vanden Berghen: 164 (1988). Type: Jamaica. Figures 18, 19.

C. jamaicense Crantz: 362 (1766); C.B. Clarke: 484 (1901/02); Schönland: 62 (1922). *C. mariscus* R. Br.: sensu C.B. Clarke: 291 (1897/98).

Icones: C.B. Clarke: t. 82, figs 7, 8 (1909); Schönland: t. 71 (1922); Kern: fig. 88 (1974); R.W. Haines & Lye: figs 666, 667 (1983); Vanden Berghen: fig. 105 (1988).

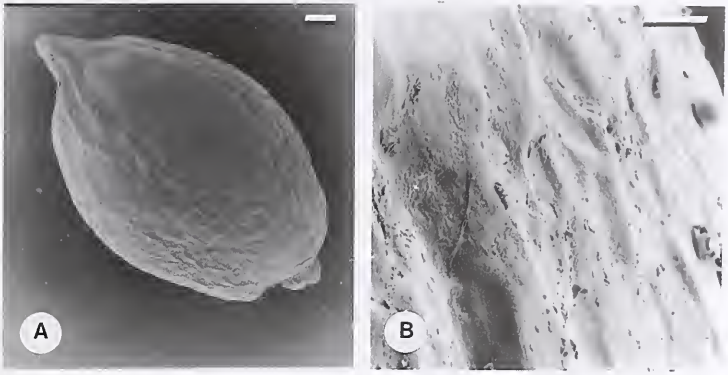

FIGURE 18.—*Cladium mariscus* subsp. *jamaicense*, *Ward 728*. Scale bars: A, 250 µm; B, 25 µm.

Vouchers: Musil 423, 425; Pooley 1535; Strey 4444; H.J.T. Venter 4208, 4483; C.J. Ward 728, 9082; M.C. Ward 2408.

Description: R.W. Haines & Lye: 323 (1983).

Distribution: Coast, Maputaland.

Tall perennial now known in Natal only from Kosi Estuary, Lake Sibayi and margins of Musi Swamps, and inland, further south, along streamlets in the Ifafa, Umtentweni area (*Strey 4444*). Earlier records show its former presence in the area of Durban (*Krauss 161; Wood 3846*) and Isipingo (*Wood 12599*). Its dark green leaves with scabrid margins and abaxial midrib, and its much-branched inflorescence bearing many dark brown spikelets make it easy to identify. *Rhynchospora corymbosa* bears some relationship in growth form and size, but inflorescences far less profuse and more compact with generally larger, paler spikelets. Achenes of *Cladium* (water distributed) are worthy of comparison with those of other aquatic species (*Cyperus pectinatus*; *Oxycaryum cubense*).

0459000 **CYPERUS**

Cyperus *L.*, Species plantarum, edn 1: 44 (1753); L.: 26 (1754); Kunth: 2 (1837); Steud.: 2 (1855); Boeck.: 436 (1867/68); Boeck.: 271 (1869/70); C.B. Clarke: 33 (1884); C.B. Clarke: 162 (1897/98); C.B. Clarke: 310 (1901/02); Schönland: 24 (1922); Kük.: 41 (1935); Podlech: 7 (1967); R.A. Dyer: 881 (1976); Gordon-Gray: 103 (1972); Kern: 592 (1974); R.W. Haines & Lye: 145 (1983); P.L. Forbes: 39 (1987b).

Cyperus L. sect. *Juncellus* Griseb.: 562 (1864). *Cyperus* L. subgen. *Juncellus* C.B. Clarke: 33 (1884). *Juncellus* C.B. Clarke: 594 (1893/94). *Cyperus* L. sect. *Pycreus* B. *Pseudopycreus* Boeck.: 485 (1867/68). Type species: *Cyperus esculentus* L. [lectotype, see Britton: 6 (1907); Britton & A. Br.: 297 (1913)].

Anosporum Nees: 287 (1834b).

Cyperus L. subgen. *Aristomariscus* Lye: 213 (1983a).

Cyperus L. subgen. *Xerocyperus* Lye: 214 (1983a).

Note: the genera *Mariscus, Juncellus, Pycreus, Kyllinga, Courtoisia* and *Anosporum* (all represented in Natal) are frequently included within *Cyperus*. In the present work, all except *Juncellus* (3 spp.) and *Anosporum* (1 sp.) are recognised as independent genera. These two are placed within *Cyperus* (in Ross 1972, *Anosporum* was included in *Cyperus* whereas *Juncellus* was independently recognised). *Courtoisia* is here included within *Mariscus*.

Key to species

Key is divided into Key A, B, C, D:
Key A: plants with leaves reduced to sheaths
Key B: inflorescence a single head, p. 47
Key C: spikelets digitate, p. 48 see 1a, 1b of Key C for details)
Key D: spikelets spicate, p. 49 (see 1a, 1b of Key C for details)

KEY A: plants with leaves reduced to sheaths

1a Plants with leaf blades developed .... Key B, p. 47
1b Plants with leaf blades reduced to sheaths, blades not longer than 10 mm, except occasionally uppermost part of shoot that may reach 80 mm 2

2a Culms septate 3
2b Culms non-septate 4

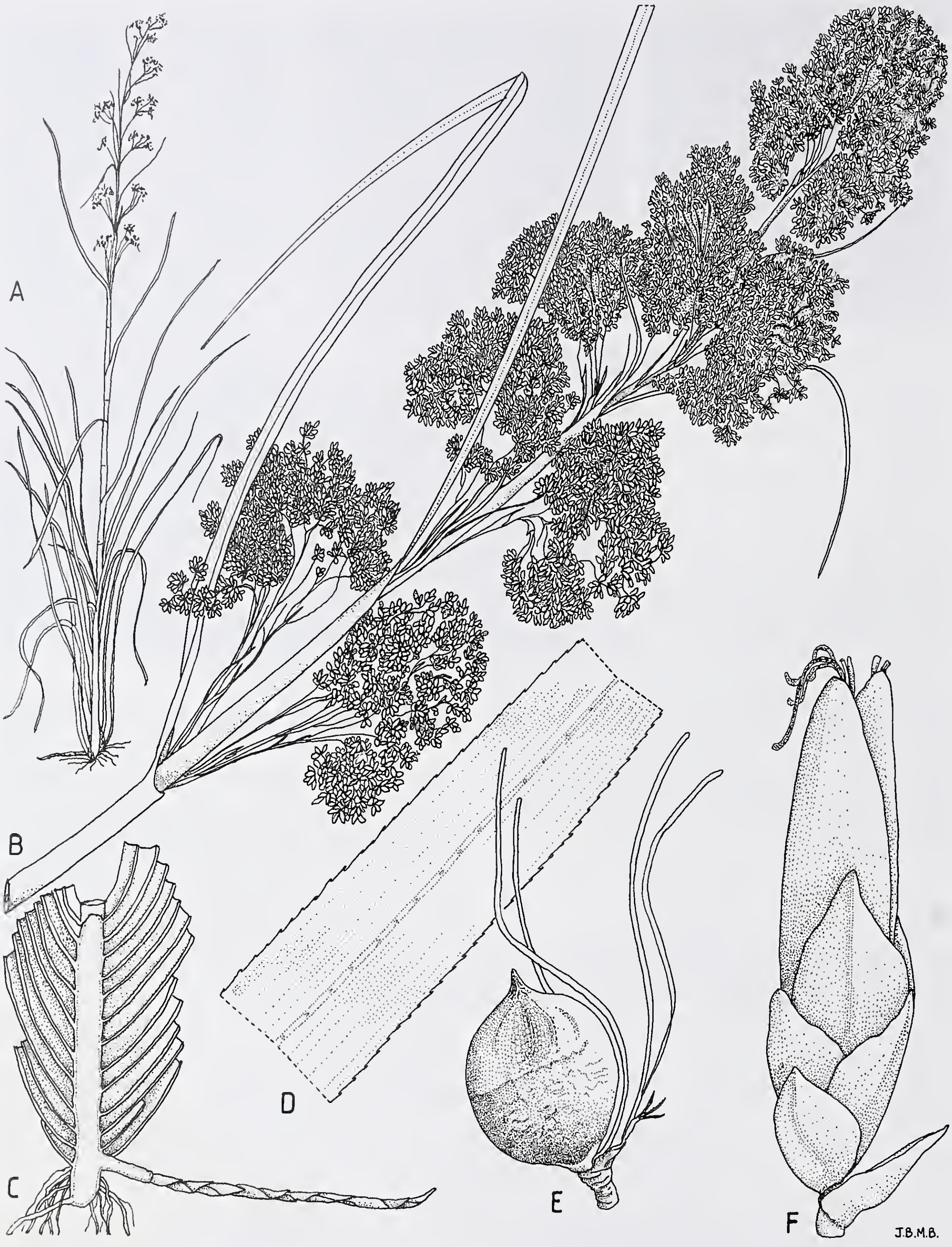

FIGURE 19.—*Cladium mariscus* subsp. *jamaicense, Ward 9082* . A, plant, × 1/15; B, inflorescence × 1/2; C, section through base of plant, × 1/2; D, part of leaf showing scabrid margin, × 2; E, achene with 2 filaments and upper unisexual floret with 2 filaments and rudimentary gynoecium, × 15; F, spikelet prior to enlargement of achene, × 17.

3a Plants perennial, stoloniferous. Culms rounded, prominently septate, especially when dry. Inflorescence bracts scale-like never leafy . . . . 4. *C. articulatus*

3b Plants perennial, stoloniferous, stolons or culm bases with tuberous swellings. Culms rounded or 3-angled, septa few, hardly discernible. Inflorescence bracts leaf-like, shorter than inflorescence rays . . . . 6. *C. corymbosus*

4a Involucral bracts leaf-like, (8–)15–25 per culm, distinctly longer than inflorescence branches and forming an involucre to them 5

4b Involucral bracts leaf-like, usually not exceeding 10 per culm, longer or shorter than inflorescence branches, OR much reduced and inconspicuous 7

5a Culms 3-angled with 3 intermediate sub-angles making 6 longitudinal ridges, ridges scabrid . . . . 39. *C. sexangularis*

5b Culms terete or faintly angled, smooth or scabrid 6

6a Culms terete, smooth below inflorescence and throughout. Rays of anthelate inflorescence smooth . . . . 44. *C. textilis*

6b Culms faintly longitudinally ridged, scabrid below inflorescence, often throughout. Rays of anthela scabrid . . . 3. *C. alternifolius*

7a Large robust plants with 3-angled culms, 10–20 mm wide. Inflorescence large compound, primary rays 200–300 per culm, each enclosed basally in a tubular prophyll with truncate mouth. Bracts brown, not green . . . . 27. *C. papyrus*

7b Plants medium-sized to small, if large and robust then differing from 7a 8

8a Style branches 2 9

8b Style branches 3 10

9a Style branches consistently 2 per floret. Achene with a flattened face adjacent to rachilla, outer face obscurely angled. Inflorescence appearing lateral, main inflorescence bract continuing in the line of the culm . . . . 20. *C. laevigatus*

9b Style branches, if 2, then accompanied in same spikelet by florets with 3-branched styles. Achene 3-angled with spongy tissue basally and a long slender apex continuing into the persistent style. Inflorescence appearing terminal, except when young . . . . 28 *C. pectinatus*

10a Plants floating or growing in water along margins of pans and streamlets. Achene 3-angled, narrowed basally and apically, style persistent (Maputaland only) (see 9b) . . . . 28 *C. pectinatus*

10b Plants differing from 10a 11

11a Inflorescence a terminal group of from 25–250 closely packed rays producing a brush-like arrangement 12

11b Inflorescence rays fewer than 25, inflorescence open, not brush-like, OR rays extremely reduced in length or lacking 13

12a Inflorescence of 100–250 rays, some of which reflex to lie close to culm. Longest bract usually longer than 30 mm 29. *C. prolifer*

12b Inflorescence of 25–60 rays that do not reflex against culm, but form an almost hemispherical (or narrower) arrangement. Longest bract usually not longer than 12 mm (see also *C.* × *turbatus* in Hybrid catalogue, p. 206 . . . . 38. *C. sensilis*

13a Spikelets closely grouped at ends of rays (appearing digitate) 14

13b Spikelets sequentially arranged along a definite axis at ends of rays (appearing spicate) 15

14a Culms soft, 3-angled, usually clearly winged below inflorescence. Anthers crested . . . . 9. *C. denudatus*

14b Culms firm, terete or obscurely 3-angled below inflorescence. Anthers lacking crests . . . . 24. *C. marginatus*

15a Perennial with elongate, usually tuberous, stolons. Inflorescences variable, usually with rays up to 70 mm long, sometimes contracted into heads. Spikelets 2–3 mm wide, hardly compressed (seashore and dune situations) . . . . . 25. *C. natalensis*

15b Plants unknown. Inflorescences large, up to 1 m wide, compound with rays far longer than 70 mm. Spikelets ± 2 mm wide (suspected spontaneous hybrid of *C. papyrus*: see also Hybrid catalogue, p. 206) . . . . 13. *C. elephantinus*

KEY B: inflorescence a single head

1a Inflorescence branched (branches usually taking the form of rays to an anthela) . . . . KEY C, p. 48

1b Inflorescence a single head of sessile spikelets 2

2a Inflorescence bright yellow . . . . 40. *C. sphaerocephalus*

2b Inflorescence other than bright yellow 3

3a Inflorescence white or off-white 4

3b Inflorescence other than white or off-white 5

4a Rhizome sympodial, stout, usually uniseriate, shoots close in sequence. Inflorescence of 10–45 (usually ± 40) spikelets. Achenes 1.3–2.0 × 1.0–1.3 mm. Widespread, chiefly Coast, rare in Uplands . . . . 26. *C. obtusiflorus*

4b Rhizome sympodial, stout, not always uniseriate, shoots forming tufts not always very closely aligned. Inflorescence of 5–20 (usually exceeding 10) spikelets. Achenes 2.2–3.0 × 1.7–2.0 mm. North Coast, Zululand, Maputaland; often sympatric with the contrast . . . . 23. *C. margaritaceus*

5a Inflorescence yellowish, sand-coloured, pinkish, reddish, greenish or grey 6

5b Inflorescence from chestnut-brown to dark brown or purplish black, sometimes with greenish or lighter markings at midrib and apex of glumes 14

6a Glume with a recurved acuminate or mucronate apex 7

6b Glume apex not recurved 12

7a Inflorescence an irregular head, closely surrounded by usually 4, long, leaf-like spreading bracts and interrupted by smaller shorter ones. Plants small tufted annuals (Maputaland only) . . . . 31. *C. pygmaeus*

7b Inflorescences, OR plants, OR distributional area, not as for the contrast 8

8a Style undivided or the arms very short, 1–3 in number 9

8b Style with 3 well-developed branches 10

9a Spikelets pink or sand-coloured, lacking greenish or reddish shading. Glume flanks with prominent close venation. Leaf blades either linear (1–2 mm wide) or widening (to 4 mm) in central zone, then curving outward .... 37. *C. semitrifidus*
9b Spikelets sand-coloured to light brown with greenish and/or reddish shading. Glume flanks with veins, but these not prominent. Leaves linear, straight, often several to a plant, 3–4 mm wide throughout .... 34. *C. rubicundus*

10a Spikelets dark greenish grey, closely packed into a globose head. Glume apex terminating in a minute, delicate, strongly recurved mucro .... 17. *C. haematocephalus*
10b Spikelets sand-coloured to light brown with greenish and/or reddish shading; if dark greenish grey then glumes each with a recurved arista (much longer than mucro in contrast) 11

11a Spikelets sand-coloured to light brown with greenish and/or reddish shading, much compressed, distinct in the inflorescence. Plants usually robust tending towards succulence .... 34. *C. rubicundus*
11b Spikelets dark with green markings, not markedly compressed nor distinct in the inflorescence (usually close-packed). Plants slender, delicate .... 36. *C. schlechteri*

12a Glumes 0.5–1.0 mm long, obtuse. Spikelets 2–6 mm long: many aggregated into the head .... 10. *C. difformis*
12b Glumes longer than 1 mm. Spikelets longer than 6 mm: not more than 20 comprising the head 13

13a Spikelets greenish (pallid when dry). Glumes with a green midrib, flanks often delicate and semi-transparent. Stamens 1 or 2 per floret .... 14. *C. eragrostis*
13b Spikelets fawn, light brown or greenish, often tinged bright red. Glumes with a green midrib, flanks not delicate, nor semi-transparent. Stamens 3 per floret .... 5. *C. compressus*

14a Plants perennial with stolons, with or without tubers or bulbs 15
14b Plants tufted, entirely lacking stolons, perennial or annual 18

15a Plants of coastal sands (Maputaland only), robust with many stiff scabrid-margined leaves. Stolons lacking bulbs or tubers. Glumes chestnut-brown, sometimes whitish basally .... 7. *C. crassipes*
15b Plants differing from 15a. Stolons usually with some evidence of bulbs or tubers 16

16a Plants with the main shoot base terminated underground by a short stem and bulb, both bearing scales. Bulb usually 6–10 mm in diameter (wider if outer scale leaves spreading). Slender lateral stolons added (these terminating in bulbs, or not). Spikelets dark reddish brown to purplish black .... 46. *C. usitatus*
16b Plants with stolons bearing tubers, or not, but never bulbs 17

17a Plants with slender wiry, horizontal stolons often terminating in small tubers. Glumes dark red-brown to purplish black, usually shining .... 33. *C. rotundus*
17b Plants with robust almost woody, usually irregularly tuberous stolons, covered, or not, in dark fibrous sheaths. Glume with a green midrib (yellow when dry), flanks dark brownish black .... 32. *C. rigidifolius*

18a Style undivided, or branches very short, 1–3 in number 19
18b Style with 3 well-developed branches 20

19a Glumes with flanks strongly marked by veins. Plants usually slender of few shoots or only one; occasionally more tufted. Leaf sheaths, when persisting in any number, then closely imbricated, seldom breaking into fibres. Spikelets usually not wider than 4 mm .... 37. *C. semitrifidus*
19b Glumes with flanks not strongly marked by veins. Plants tufted, the shoot bases slightly swollen by rather loosely imbricated leaf sheaths that do not become fibrous. Spikelets 4–5 mm wide .... 34. *C. rubicundus*

20a Glume with a midrib and one clearly marked longitudinal vein on each flank 21
20b Glume with a midrib and more than one clearly marked longitudinal vein on each flank 22

21a Plants very slender, short annuals, the basal leaf sheaths often purple-tinged .... 8. *C. cuspidatus*
21b Plants tufted perennials, leaves rather stiff forming a basal rosette to the shoot; sheaths not purple-tinged .... 42. *C. tenax*

22a Leaf sheaths at base of shoot usually not forming a thick investing layer, but shoot bases sometimes slightly swollen. Glumes reddish brown to chestnut-brown 23
22b Leaf sheaths at base of shoot forming a thick investing layer either fibrous or not. Glumes dark brown, if chestnut-brown with a greenish midrib, then leaves stiff and almost succulent with obtuse apices 24

23a Spikelets linear (± 3 mm wide), margins parallel, scarcely serrated by the minute mucros of glumes; spikelets often variable in length within an inflorescence and a plant .... 45. *C. thorncroftii*
23b Spikelets linear-lanceolate to elliptic-oblong (4–5 mm wide), clearly serrated (squarrose) by the excurrent mucros terminating glumes; spikelets usually not variable in length within an inflorescence and a plant .... 34. *C. rubicundus*

24a Spikelets dark brown, ovate or elliptic. Glumes fairly laxly imbricated, spikelet margins coarsely serrate. Achenes 1.0–1.2 × 0.6–0.8 mm .... 35. *C. rupestris* var. *rupestris*
24b Spikelets dark brown, lanceolate to linear-lanceolate. Glumes imbricated, spikelet margins finely serrate. Major inflorescence bract long, overtopping inflorescence. Achenes 0.5–0.7 × 0.4–0.5 mm .... 35. *C. rupestris* var. *parvinux*
24c Spikelets chestnut-brown, shining, linear with parallel, finely serrated margins. Glumes neatly and closely imbricated, midrib of each greenish in life, when young. Leaves stiff, almost succulent, apices obtuse. Achenes 0.7–0.9 × 0.6–0.7 mm .... 35. *C. rupestris* var. *amnicola*

Key C: spikelets digitate

1a Inflorescence with branches forming rays; spikelets sequential along a definite axis formed by the terminal portion of ray, appearing spicate .... KEY D, p. 49
1b Inflorescence with branches forming rays; spikelets grouped at ends of rays, or very closely packed, appearing digitate 2

2a Plants annual, sparsely or occasionally more densely tufted, lacking perennating organs 3
2b Plants perennial 10

3a Glumes not longer than 2.0 mm 4
3b Glumes longer than 2.0 mm 6

4a Spikelets very numerous, densely congested in the inflorescence. Glumes elliptic to obovate, apex minutely mucronate; greenish yellow often tinged red or brown, but never uniform brown. Culms triangular, soft .... 10. *C. difformis*
4b Spikelets not densely congested in the inflorescence; other features differing from 4a 5

5a Achene 0.7–0.8 × 0.3–0.4 mm; reddish brown to greyish at maturity; surface densely papillose. Glumes with recurved mucro 0.5–0.6 mm long .... 8. *C. cuspidatus*
5b Achene 0.4–0.5 × 0.25–0.3 mm; white or pale brown, shining at maturity; surface marked by large cells. Glumes with minute recurved mucro .... 43. *C. tenuispica*

6a Spikelets in life, green or fawn with greenish and/or reddish markings; when dry, pallid or brown with, or without, greenish and/or reddish markings 7
6b Spikelets pink, fawn or brown, or if dark greenish greyish brown with faint reddish markings, then spikelets closely aggregated into globose heads, each inflorescence comprising 1 sessile head with 1–4(–7) pedunculate heads added 8

7a Spikelets greenish (pallid when dry). Glumes with a green midrib, flanks often delicate and semi-transparent. Stamens 1 or 2 per floret .... 14. *C. eragrostis*
7b Spikelets fawn or light brown or greenish, often tinged bright red. Glume with green midrib, flanks not delicate nor semi-transparent. Stamens 3 per floret .... 5. *C. compressus*

8a Style undivided, or with short, poorly developed branches, 1–3 in number .... 37. *C. semitrifidus*
8b Style with 3 well-developed branches 9

9a Inflorescence consisting of spikelets crowded into dense globose heads, the central sessile, with 1–4(–7) terminating slender rays, added .... 17. *C. haematocephalus*
9b Inflorescence with long spikelets (5–22 mm) clearly defined, not crowded into globose heads. Rays of inflorescence from 2–10 .... 47. *C. zollingeri*

10a Plants with stolons 11
10b Plants lacking stolons, if with well-developed rhizomes, then these short so that the aerial shoots are closely arranged 13

11a Plants of shaded situations (margins of forest, open disturbed woodland, in plantations of exotics). Stolons elongate, irregularly tuberous. Inflorescence anthelate, rays of different length, some carrying solitary spikelets. Leaves and bracts with 3 main veins that become whitish and easily visible on drying. Glume margin sparsely fringed with short hairs .... 1. *C. albostriatus*
11b Plants differing from 11a 12

12a Plants of coastal sands (Maputaland only), robust with many stiff, scabrid-margined leaves. Glumes chestnut-brown, sometimes whitish basally .... 7. *C. crassipes*
12b Plants of grassland or disturbed situations (sometimes weedy). Coast, Midlands (distribution in Natal not fully known). Leaves well developed, not stiff nor scabrid-margined. Glume with midrib green, yellow when dry, flanks dark brownish black .... 32. *C. rigidifolius*

13a Glume with a midrib and one clearly defined longitudinal vein on each flank. Plants tufted, leaves rather stiff forming a basal rosette to the shoot .... 42. *C. tenax*
13b Glume and plant not as in 13a 14

14a Robust plants with strongly developed, abbreviated rhizomes. Leaves numerous, 5–10 mm wide. Culms 0.5–1.0 m high, triangular, winged, ± 3 mm in diameter below inflorescence. Spikelets brown, overtopped by leafy bracts ..... 30. *C. pulcher*
14b Plants of moderate size, tufted or slender. If leafy and spreading, then spikelets golden brown with greenish and/or reddish markings and some evidence of proliferation from inflorescence 15

15a Glume greenish to golden brown or reddish brown with a well-developed midrib, green in life, pallid when dry, that may be minutely excurrent into a straight projection. Inflorescences anthelate with numerous rays variable in length, usually showing some evidence of proliferation .... 41. *C. sphaerospermus*
15b Glume fawn, pink, brown, dark purplish black or greenish grey-brown; apex excurrent into a recurved apiculum or mucro ... 16

16a Style branches well developed, 3 in number. Glume tipped by a minute strongly recurved mucro .... 17. *C. haematocephalus*
16b Style unbranched or with 1–3 short, poorly developed branches. Glume tipped by an excurrent straight or slightly recurved apiculum, flanks each with several strongly marked veins .... 37. *C. semitrifidus*

KEY D: spikelets spicate

1a Style branches 2 .... 2. *C. alopecuroides*
1b Style branches 3 2

2a Glume 1.3–1.6 mm long, obovate or round in outline with a notch and minutely excurrent midrib, greenish yellow to golden brown, occasionally red-tinged. Plants annual, very variable in size .... 19. *C. iria*
2b Glume and plants not precisely as in 2a 3

3a Plants annual. Spikelets 5–22 mm long, dull brown or greenish brown, hardly compressed, sometimes almost 4-angled 47. *C. zollingeri*
3b Plants perennial with stolons, or rhizomes, or shoot bases thickened and hardened 4

4a Plants with elongate stolons 5
4b Plants lacking elongate stolons 13

5a Stolons rather fine, wiry, terminating in small tubers. Inflorescence golden yellow or dark red-brown to purplish. Leaves usually clearly 3-ranked 6
5b Stolons coarse, not terminating in small tubers, but variously swollen at irregular intervals, or at shoot bases, or both, or lacking tuberous swellings. Inflorescence brown, sometimes with dark brown markings; if glume flanks dark purplish black, then midrib green (yellow when dry). Leaves clearly 3-ranked only in young shoots 7

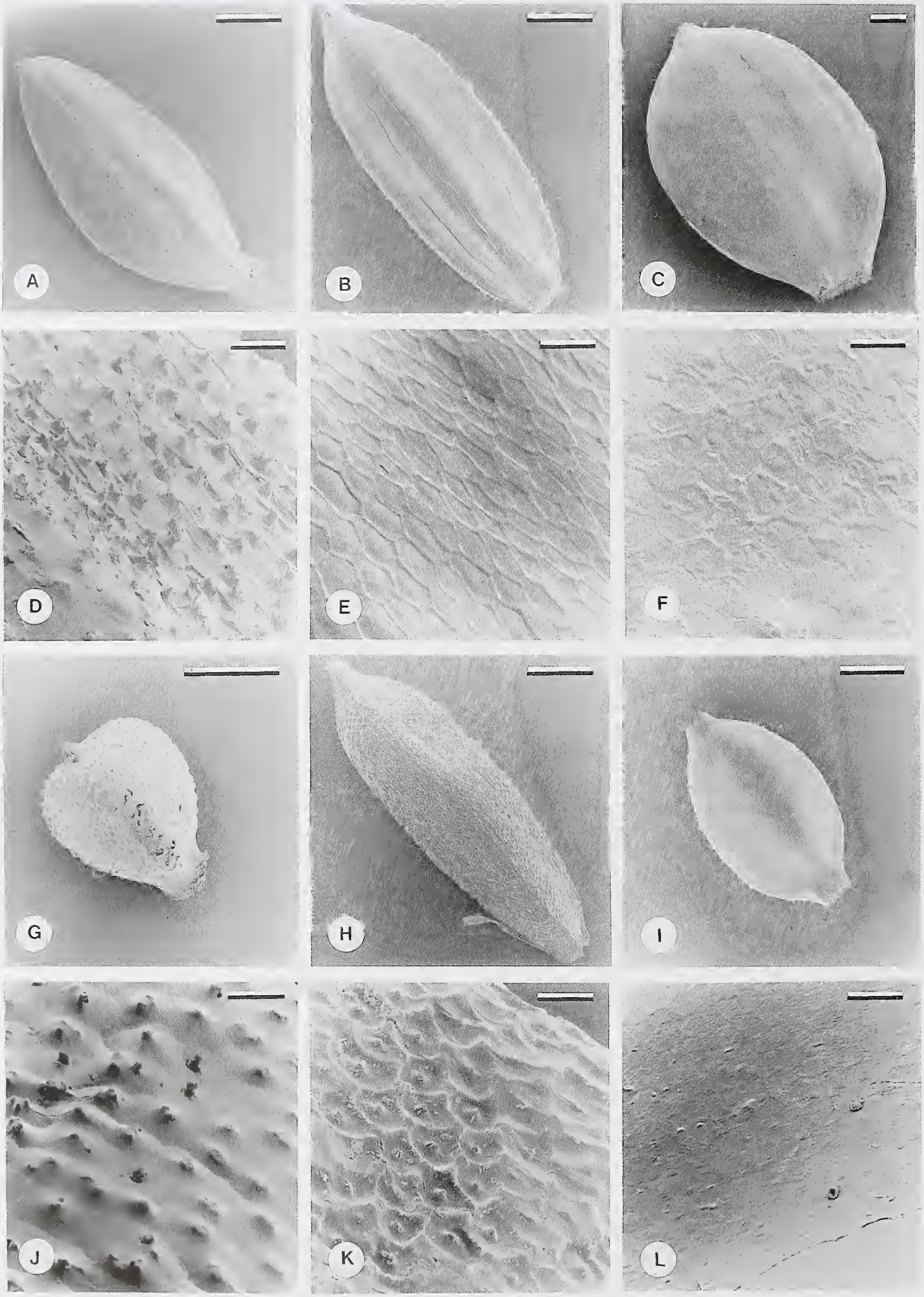

FIGURE 20.—*Cyperus*. A, D, *C. albostriatus, Killick 215*; B, E, *C. articulatus, Ward 8866* ; C, F, *C. crassipes, Ward 7090*; G, J, *C. denudatus* var. *denudatus, Leisegang 66*; H, K, *C. distans, Cadman et al. 3258*; I, L, *C. dives, B.J. Huntley 681*. Scale bars: A–C, G–I, 250 µm; D–F, J–L, 25 µm.

6a Inflorescence golden yellow. Glumes with thin basal wings, flanks conspicuously 3–4-veined, veins fading before the membranous obtuse apex .... 15. *C. esculentus*
6b Inflorescence dark red-brown to purplish. Glumes clearly winged basally, flanks 2–3-veined, fading some distance before the membranous margin .... 33. *C. rotundus*

7a Robust plants often higher than 1 m. Leaves 6–30 mm wide, stiff, margins smooth. Inflorescence a spreading, compound, long-bracteated anthela; radioli scabrid .... 21. *C. latifolius*
7b Plants medium-sized to small, if culms 1 m high then occupying seashore or estuarine situations, inflorescences not widely spreading and bracts often reduced 8

8a Spikelets golden yellow, light brown, or dark brown 9
8b Spikelets dark red-brown to purplish black, or if dark brownish black, glume midribs green in life, yellow when dry 12

9a Glumes golden yellow; flanks 3–4-veined, veins fading before the membranous, obtuse apex .... 15. *C. esculentus*
9b Glumes uniformly light brown or dark brown with lighter brown membranous margins 10

10a Plants of seashore and estuarine situations, very variable in degree of leaf development (often sheaths only) and in inflorescence form (anthela with few rays, longest to 170 mm, or condensed to a head). Glumes coarse, hard, uniform light brown (pallid when dry). Spikelets hardly compressed .... 25. *C. natalensis*
10b Plants of wet situations, usually in natural grassland, or of waste places, or as weeds of cultivation. Leaves and inflorescence bracts well developed with a prominent lateral vein on either side of midrib. Glumes soft or membranous dark brown with light brown margins, or mid-brown with green midrib (occasionally green with red or golden brown markings on flanks). Spikelets compressed or hardly so 11

11a Plants of wet situations in natural vegetation (usually grassland); never weeds. Glumes dark brown with lighter brown membranous margins .... 22. *C. longus*
11b Plants of waste places, often weeds of cultivation. Glumes mid-brown with green midrib (occasionally green with red or golden brown marking on flanks) .... 33. *C. rotundus* subsp. *tuberosus*

12a Glumes dark red-brown to purplish black. Plants with slender, wiry stolons terminating in small rounded tubers (not always developed) .... 33. *C. rotundus* subsp. *rotundus*
12b Glumes with a green midrib (yellow when dry), flanks dark brownish black. Plants with robust, almost woody, irregularly tuberous stolons, covered, or not, in dark fibrous sheaths .... 32. *C. rigidifolius*

13a Spikelets very much longer than wide, scarcely compressed. Glumes distant, only slightly overlapping, each with a distinct apical zone of membranous tissue. Inflorescence a compound anthela, usually very lax and open carrying many spikelets .... 11. *C. distans*
13b If spikelets much longer than wide, then with glumes imbricated and overlapping; glumes differing also in other respects from 13a. Inflorescence often large and compound, with many spikelets, but these directed upwards against the axis of the spike bearing them, therefore spikes compact, not lax 14

14a Culms sharply triangular to winged below inflorescence. Leaves and bracts glaucous abaxially. Glume with golden to reddish nerveless flanks; midvein green to brown terminating in the acute apex or excurrent into a minute mucro. Spikelets linear, straight-margined .... 16. *C. fastigiatus*
14b Culms bluntly triangular below inflorescence. Leaves not clearly glaucous abaxially. Glume differing from 14a. Spikelets linear-lanceolate or ovate-lanceolate with margins serrate 15

15a Robust plants higher than 1 m. Leaf blades 15–35 mm wide, these and inflorescence bracts firm in texture, scabrid-margined. Glume 1.2–1.8 mm long, light brown to medium brown, sometimes almost golden. Inflorescence spikes 6–15 mm wide with spikelets slightly spreading from axis but never patent. Achene 0.6–0.8 mm long, pale grey with darker grey base and apex, surface smooth .... 12. *C. dives*
15b Plants usually not reaching 1 m in height. Leaf blades 4–8 mm wide, these and inflorescence bracts rather soft in texture, margins generally scabrid. Glume 0.9–1.2 mm long, pallid brown or greenish. Inflorescence spikes 3–8 (–10) mm wide with spikelets appressed to axis and markedly overlapping one another. Achene 0.5–0.6 mm long, reddish brown at maturity, surface smooth or marked by small cells. (Maputaland only) .... 18. *C. imbricatus*

1. **Cyperus albostriatus** *Schrad.*, Analecta ad floram Capensem 1. Cyperaceae: 7 (1832b); Kunth: 34 (1837); Hochst.: 754 (1845); Steud.: 20 (1855); Boeck.: 581 (1867/68); C.B. Clarke: 131 (1884); C.B. Clarke: 546 (1894b); C.B. Clarke: 176 (1897/98); Schönland: 27 (1922); Kük.: 205 (1936); P.L. Forbes: 43 (1987b). Figure 20A, D.

C. pulcher Spreng.: 5 (1829) non Thunb.

C. mariscus Nees: 515 (1832); Nees: 284 (1834b); Nees: 134 (1835); Kunth: 106 (1837).

Icones: Schönland: t. 15 (1922).

Vouchers: *Macdonald 303; C.J. Ward 4598, 7501, 7629, 7733, 8622.*

Description: C.B. Clarke: 176 (1897/98).

Distribution: widespread.

Frequent in Natal in shaded, often rocky, not necessarily damp situations on margins of forest, in woodland and in plantations of exotics (pines, rarely eucalypts). Stoloniferous leaf-bearing perennials recognisable by their graceful, open anthelate inflorescences surrounded by eight or more spreading leaf-like bracts. Rays of anthela vary in length within an inflorescence: some of them carry only solitary spikelets, but on others, spikelets digitately clustered. The complex of species within which *C. albostriatus* is placed needs further study. This includes particularly *C. leptocladus* Kunth which Forbes (1987b) distinguished from *C. albostriatus* on characters that will be summarised below. There are citations of *C. leptocladus* from Natal by Clarke (1897/98), namely *Sutherland s.n.*; *Kuntze 227*; *Drège 4441*; *Buchanan 318*, and by Kükenthal (1936), who added *McClean 185* to the Drège and Buchanan specimens already listed by Clarke. *C. smithii* McClean (1927b) is generally regarded as a synonym of *C. leptocladus* (Kükenthal 1936; Reid 1985), but the taxon needs re-evaluation in relation to what Forbes (1987b) described as '... a form [of *C. albostriatus*] with narrow blades which may be difficult to separate from *C. leptocladus*'. This form may be *C. prasinus* Kunth that Clarke (1897) stated had been reduced to *C. al-*

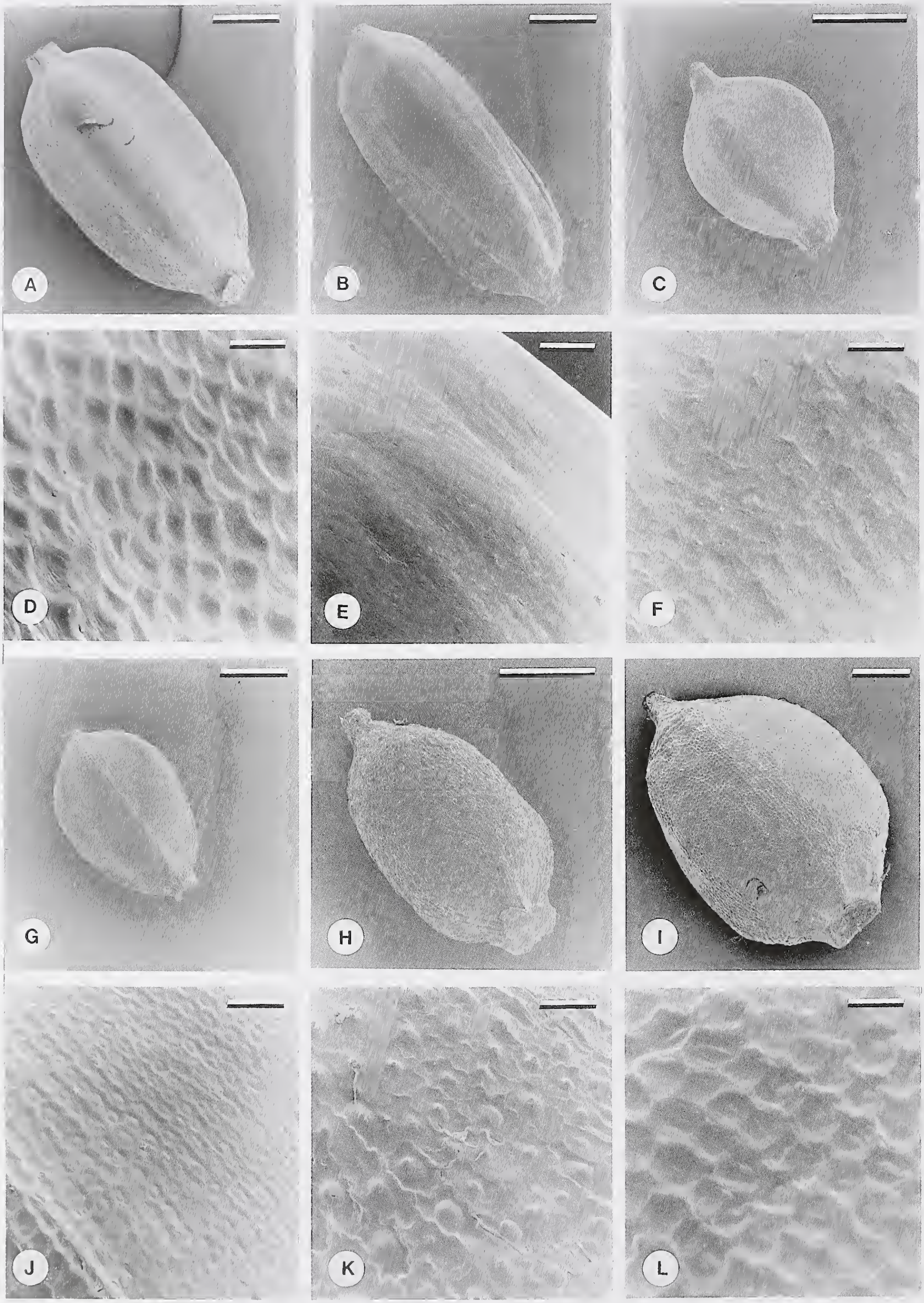

FIGURE 21.—*Cyperus*. A, D, *C. esculentus*, *J. Browning 194*; B, E, *C. fastigiatus*, *Downing 107*; C, F, *C. haematocephalus*, *J. Browning 182*; G, J, *C. imbricatus*, *Pooley 365a*; H, K, *C. alternifolius* subsp. *flabelliformis* = *C. involucratus*, *Feely & Ward 19*; I, L, *C. laevigatus*, *Dutton 21*. Scale bars: A–C, G–I, 250 µm; D–F, J–L, 25 µm.

bostriatus at Kew. Kükenthal (1936) equated *C. prasinus* p.p. *sensu* C.B. Clarke (1897) *non* Kunth with *C. mossii* Turrill (1925) (type: Transvaal, near Johannesburg, *Moss 218*) reducing the status of Turrill's species to a variety under *C. albostriatus*, and citing it for Natal (*Kuntze 227, Buchanan 318*). The complex is further confused by unusual gatherings from Swaziland (by more than one collector).

C. albostriatus (after Forbes 1987b)

Leaf blades and inflorescence bracts, 4–13 mm wide, flattish, thin and soft in texture, with 3 main veins becoming white and conspicuous on drying. Glumes sparsely fringed with short hairs.

C. leptocladus (after Forbes 1987b)

Leaf blades and bracts 3.5–5.5 mm wide, corrugated, firm in texture, 3 main veins paling but not whitening on drying. Glume margins glabrous. Plants more robust than those of *C. albostriatus*.

Both 'species' occasionally occur in close association (for example, Oribi Gorge).

2. **Cyperus alopecuroides** *Rottb.*, Descriptiones plantarum rariorum: 20 (1772); Rottb.: 38 (1773); Vahl: 368 (1805); Kunth: 19 (1837); Steud.: 13 (1855); C.B. Clarke: 283 (1883a); C.B. Clarke: 30 (1884); K. Schum.: 121 (1895); Kük.: 71 (1935); Kern: 603 (1974); R.W. Haines & Lye; 181 (1983). Type: Arabia, *Forsskål s.n.* (C).

Juncellus alopecuroides (Rottb.) C.B. Clarke: 595 (1893/94); C.B. Clarke: 543 (1894b); C.B. Clarke: 307 (1901/02).

Icones: Rottb.: t. 8, fig. 2 (1773); C.B. Clarke: t. 2, fig. 12 (1884); R.W. Haines & Lye: fig. 348 (1983); Vanden Berghen: figs 107, 108 (1988).

Voucher: *Strey 23* (PRE).

Description: R.W. Haines & Lye: 181 (1983).

Distribution: Maputaland.

Distributed through tropical and north Africa, Madagascar, India, Indo-China, Malesia and northern Australia. There are many synonyms of which only the best known one is listed here.

Fairly robust leaf-bearing perennials with short rhizome, anthelate, shortly branched and thus fairly contracted, inflorescence subtended by several leafy bracts. The best means of identification is by the 2-branched style and biconvex achenes (hence Clarke's placing of the species under *Juncellus* C.B. Clarke); but these criteria are not constant and 3-branched styles and trigonous achenes are occasional within inflorescences where the lesser style branch number predominates. Stolons occasionally developed, probably only in a second year of growth.

The species is rare in Natal and only from Maputaland (perhaps in Zululand ?). There is the possibility that it has been either overlooked in the field or misidentified in herbaria. Preferred habitats are swamps with permanent water, or the margins of lakes.

3. **Cyperus alternifolius** *L.*, Mantissa plantarum: 28, 82 (1767); Baijnath: 521 (1975); Kukkonen: 59 (1990). Type: LINN 70: 40 lecto: selected Baijnath (1975).

subsp. *alternifolius*: Kukkonen (1990) remarks that under natural conditions, this is now a rare plant in Madagascar and the Mascarenes. Records from the African continent are probably erroneous (Kükenthal 1936). However, it may be present on that continent under cultivation. Culms smooth under inflorescence; rays of anthela also smooth. Glumes are lanceolate and achenes narrowly oblong, about 1.0 × 0.3 mm. Not recorded in Natal, but perhaps present (see p. 54).

subsp. **flabelliformis** *Kük.* in Das Pflanzenreich 4, 20, Heft 101: 193 (1936); Kukkonen: 63 (1990). Type: Rottb.: t. 12, fig. 2 (1773) (iconolecto., selected Kukkonen 1990). Figure 21H, K.

Cyperus flabelliformis Rottb.: 42 (1773) nom. illeg. (nom. nov.). *C. involucratus* Rottb.: 22 (1772); R.W. Haines & Lye: 154 (1983). Type: iconolecto as above. Non *C. involucratus* Poir.: 253 (1806) = *C. imbricatus* Retz. (1789) see Kük. (1936). Non *C. gradatus* Forssk.: 13 (1775).

Icones: R.W. Haines & Lye: fig. 283 (1983).

Vouchers: *Edwards 2558; Feely & Ward 19; Kluge 2640* (CPF); *Van Wyk 948* (CPF); *Venter 4118* (PRE); *C.J. Ward 8680.*

Description: R.W. Haines & Lye: 154 (1983) as *C. involucratus* Rottb.

Distribution: Coast (mostly north of Durban); Maputaland.

Robust, rhizomatous perennial plants with firm erect culms, leafless except for basal sheaths, but carrying 15–25 leafy bracts subtending many-rayed anthela of digitate clusters of fawn to medium brown spikelets. Well known in Natal as component of coastal swamp forest, usually in more open patches in standing water where substrate is black from accumulated, slowly decaying humus. Also present bordering permanent water bodies, rivers, streams and lakes, often in shade of woody vegetation. Subsp. *flabelliformis* differs from typical subspecies in slightly ridged and scabrid culm apex, usually rough rays of inflorescence, broadly ellipsoid glumes and achenes also broadly ellipsoid, about 0.6–0.8 × 0.5 mm.

Very closely related to *C. alternifolius* subsp. *flabelliformis* are two other species represented in Natal, *C. sexangularis* Nees and *C. textilis* Thunb. The former differs in its slightly more slender form and in the 6-angled scabrid culms; the latter may be recognised by its terete, smooth culms usually entirely lacking scabrid outgrowths, and by the fairly short bracts of the inflorescence (up to 100 mm long) that are tipped with a penetrating apex. Kükenthal (1936) segregated both from *C. alternifolius* subsp. *flabelliformis* on the lesser number of involucral bracts (8–12; up to 20 in *C. alternifolius*). This criterion needs confirmation: for Natal plants it is not reliable. The group of species as a whole should be carefully investigated in Natal and in southern Africa (presently under consideration by Dr Baijnath, University of Durban, Westville).

Note: Kukkonen (1990) has explained that following upon Kükenthal's (1936) reduction of *C. involucratus* to subspecific level as *C. alternifolius* L. subsp. *flabelliformis*, subsequent systematic treatment has varied. Some authorities maintain two species, (Clarke 1901/02; Kern 1974; Baijnath 1975; Haines & Lye 1983); others do not (Koyama 1979, 1985; Hooper 1985). If two species are maintained then their names are *C. involucratus* Rottb. and *C. alternifolius* L. In the present work it is considered advisable to accept two subspecies within *C. alternifolius* because there is the possibility that typical *C. alternifolius* may be present in southern Africa (Natal ?) under cultivation and as an escape. Also the plexus of the three closely related species named above are under study. Differences between typical *C. alternifolius* and *C. textilis* need to be particularly carefully established.

4. **Cyperus articulatus** *L.*, Species plantarum 1: 44 (1753); L.: 66 (1762); Kunth: 53 (1837); Steud.: 30 (1855); Boeck.: 274 (1869/70); C.B. Clarke: 291 (1883a); C.B. Clarke: 155 (1884); C.B. Clarke: 548 (1894b); C.B. Clarke: 356 (1901/02); Kük.: 77 (1935); R.W. Haines & Lye: 183 (1983). Type: from Jamaica. Figure 20B, E.

C. niloticus Forssk.: 13 (1775); Vahl: 302 (1805); Steud.: 30 (1855). Type: from Egypt (?).

C. borbonicus Steud.: 31 (1855). Type: from Ins. Borbon.

Chlorocyperus articulatus (L.) Rikli: 563 (1895).

Icones: R.W. Haines & Lye: fig. 353 (1983); Vanden Berghen: fig. 110 (1988).

Vouchers: *Edwards 6060; C.J. Ward 390, 4199, 5605, 8866, 9136; M.C. Ward 974.*

Description: R.W. Haines & Lye: 183 (1983).

Distribution: Coast, Midlands, N Natal, Maputaland.

Widespread in tropical and warm regions of both hemispheres. Robust, stoloniferous perennial plants, when well grown, easily recognised by septate culms up to about 1 m high topped by anthelate inflorescence of 5–40 × 1.0–2.0 mm spikelets, fawn to mid-brown (sometimes darker) and spicately arranged towards tips of rays. Leaves reduced to sheaths and inflorescence bracts scale-like or very short.

In Natal there are often extensive stands in the wet, organically rich sediments at the edges of freshwater pans, in sand and alluvium along river banks, or in shallow, somewhat brackish backwaters of coastal swamps.

Characteristic as the species is in Natal, there are many variants; some with few septa to the culms; others with imperfectly formed spikelets; others less robust than the majority of specimens. It is advisable to consider that hybridisation with other *Cyperus* species growing sympatrically is a possibility (*C. natalensis* Hochst. in particular). Many of the atypical examples seen in both field and herbarium may be the outcome of introgression. This needs confirmation from karyological investigation.

5. **Cyperus compressus** *L.*, Species plantarum 1: 46 (1753); L.: 68 (1762); Rottb.: 27 (1773); Kunth: 23 (1837); Steud.: 15 (1855); Boeck.: 517 (1867/68); C.B. Clarke: 284 (1883a); C.B. Clarke: 97 (1884); C.B. Clarke: 553 (1894b); C.B. Clarke: 179 (1897/98); C.B. Clarke: 347 (1901/02); Kük.: 156 (1935); Podlech: 13 (1967); R.W. Haines & Lye: 266 (1983). Type: from America.

Icones: Rottb.: t. 9, fig. 3 (1773); R.W. Haines & Lye: fig. 542 (1983).

Vouchers: *C.J. Ward 661, 3349, 4852, 5430, 6489; Wells 1073.*

Description: R.W. Haines & Lye: 266 (1983).

Distribution: Coast, Midlands, Maputaland.

Cosmopolitan in distribution, occurring in tropical, subtropical and temperate regions of world. Tufted, leaf-bearing annuals with fibrous roots; variable in size from short slender specimens bearing a single culm with head of 3–6 spikelets, to medium-sized compact or slender herbs with open compound or simple anthelas. Large, many-flowered spikelets, 10–50 mm × 3–5 mm, with glumes neatly imbricated and greyish green, usually well spotted or marked with rich brownish red, smooth achenes and annual habit are main diagnostic features. There is some similarity with *C. rubicundus* (No. 34), but in that species shoot bases tend to be swollen and spikelets have a serrated margin.

In Natal plants of *C. compressus* are weeds of cultivation. Well-grown, pot-cultured individuals are ornamental and easy to maintain.

6. **Cyperus corymbosus** *Rottb.*, Descriptionum et iconum rariores: 42 (1773); C.B. Clarke: 158 (1884); C.B. Clarke: 554 (1894b); C.B. Clarke: 181 (1897/98); C.B. Clarke: 357 (1901/02); Rendle: 116 (1899); Kük.: 185 (1926); Kük.: 80 (1935); Podlech: 14 (1967); R.W. Haines & Lye: 183 (1983). Type: from India.

C. articulatus Ridl.: 141 (1884) p.p. non L.

Icones: Rottb.: t. 7, fig. 4 (1773); Kük.: fig. 10 (1935); R.W. Haines & Lye: fig. 354 (1983).

Vouchers: *Drège 4406* (PRE); *C.J. Ward 664.*

Description: C.B. Clarke: 181 (1897/98).

Distribution: Coast, Maputaland.

Reported from Africa, Madagascar, Nepal, India, Burma, northern Australia, West Indies and tropical South America. There are many synonyms, (only one listed here) and many varieties, Kükenthal (1935) recognised six. In Africa there are records from the Mediterranean area, West Africa, tropical and South Africa. Nowhere, however, are plants extensive (Clarke 1897/98, 1901/02, cites only solitary specimens; Haines & Lye 1983 report it as 'rare' for East Africa). In Natal it is uncommon and seldom collected. It is distinguished from *C. articulatus* L. by narrower culms, not at all or sparsely septate; leaf sheaths sometimes bearing short blades; short leaf-like inflorescence bracts. It grows, usually, in association with *C. articulatus* L. and the possibility that *C. corymbosus* comprises a series of genotypes derived from *C. articulatus* by way of spontaneous hybridisation with another parent (at present unknown, but *C. natalensis* suspected for Natal), followed by backcrossing, should not be ignored. In this context it is interesting that Kükenthal (1935) cited *R.E. & T.C.E. Fries 3247* (Durban) which has not been seen. Is it only coincidence that *R.E. & T.C.E. Fries 3248* is cited by this same author as *C. natalensis* Hochst.? *Ward 664* has tuberous swellings at intervals along the stolons, a character not recorded for *C. articulatus* L. but quite frequent in *C. natalensis* Hochst. (see also under Hybrid catalogue, p. 205).

7. **Cyperus crassipes** *Vahl*, Enumeratio plantarum 2: 311 (1805); Kunth: 82 (1837); Steud.: 44 (1855); Boeck.: 539 (1867/68); R.W. Haines & Lye: 263 (1983). Type: West Africa, Guinea, *Isert s.n.* (C). Figure 20C, F.

C. scirpoides Vahl: 311 (1805); Schumach.: 54 (1827); Kunth: 107 (1837); Steud.: 29 (1855). Type: Guinea, *Thonning s.n.*

C. maritimus Vahl: 309 (1805); Poir.: 240 (1806); Kunth: 47 (1837); Boeck.: 539 (1867/68); C.B. Clarke: 285 (1883a); Ridl.: 135 (1884); C.B. Clarke: 569 (1894b); Rendle: 113 (1899); C.B. Clarke: 326 (1901/02).

C. cephalostachyus Steud.: 315 (1855).

Icones: R.W. Haines & Lye: fig. 534 (1983); Vanden Berghen: fig. 115 (1988).

Vouchers: *Moll 4873* (PRE); *Strey & Huntley 5001; Tinley & Ward 20; P.J. Vorster 2628* (PRE); *C.J. Ward 3956, 7090.*

Description: R.W. Haines & Lye: 263 (1983).

Distribution: Maputaland.

Robust, coarse, stoloniferous, leafy perennials (blades 3–8 mm wide) growing in sand of river banks, or more often sea shore. Inflorescences anthelate, rays often short, giving a contracted, globose form or occasionally there may be reduction to an unbranched head; subtending bracts 4–8, long and leaf-like. Long (up to 20 mm), linear-lanceolate spikelets digitate on rays, or sessile in head. Glumes pale to light reddish or chestnut-brown. The coarseness of the plants, their habitats and localised distribution in Natal, make misidentification unlikely, except, perhaps, for possible confusion with the genus *Mariscus.*

8. **Cyperus cuspidatus** *Kunth* in Humb., Bonpl. & Kunth, Voyage aux regions equinoctiales du Nouveau Continent, partie 6, Botanique, Sect. 3, Nova genera et species plantarum: 204 (1816); Kunth: 22 (1837); Steud.: 14 (1855); Boeck.: 496 (1867/68); C.B. Clarke: 88 (1884); Kük.: 261 (1936); Kern: 629 (1974); R.W. Haines & Lye: 252 (1983). Type: from South America.

C. uncinatus C.B. Clarke: 580 (1894b); C.B. Clarke: 328 (1901/02).

Icones: Kük.: fig. 29 E (1936); Kern: fig. 59 (1974); R.W. Haines & Lye: figs 507, 508 (1983); Vanden Berghen: fig. 116 (1988).

Voucher: *Cl. Reid 1025* (PRE).

Description: R.W. Haines & Lye: 252 (1983).

Distribution: Maputaland.

Pantropical in distribution. Slender, rather stiff, leaf-bearing annuals 20–100 mm high, shoot bases usually reddish brown to purple. Inflorescence often a head of 4–16 sessile, digitate spikelets (occasionally reduced to fewer or, in well-grown examples, with rays added to form a simple anthela). Leaves and inflorescence bracts long acuminate. Linear, strongly compressed spikelets carry imbricated (becoming patent in age), narrowly oblong to elliptic glumes, prominently 3-nerved, with midrib excurrent into recurved mucro 0.5–0.6 mm long. Mature achenes, 0.7–0.8 × 0.3–0.4 mm, trigonous, reddish brown to dark grey with short apiculum, surface densely papillose.

In Natal, plants grow in open, moist, usually disturbed localities. They have been little collected; probably overlooked because of their small stature. There is the possibility of confusion with similar looking small annuals belonging to *Pycreus* (2 style branches and biconvex achenes), that may be sympatric. There is also the possibility that the close relative of *Cyperus cuspidatus, C. amabilis* Vahl, that grows in Swaziland and probably Mozambique, may be present in Maputaland, Zululand, northern Natal or the Midlands. All small annual sedges should be carefully studied in the field, as different species are often represented in one limited locale.

9. **Cyperus denudatus** *L. f.*, Supplementum plantarum: 102 (1781); Steud.: 152 (1829); Steud.: 22 (1855); Schrad.: 8 (1832b); Kunth: 36 (1837); C.B. Clarke: 555 (1894b); C.B. Clarke: 173 (1897/98); C.B. Clarke: 338 (1901/02); Rendle: 115 (1899); Kük.: 254 (1936); Levyns: 99 (1950); R.W. Haines & Lye: 169 (1983); P.L. Forbes: 43 (1987b). Type: from India.

C. lanceus Schult.: 106 (1824) non Thunb.

C. spretus Steud.: 21 (1855).

C. amphibolus Steud.: 22 (1855).

C. sphaerospermus Schrad. var. *triqueter* C.B. Clarke: 578 (1894b); C.B. Clarke: 172 (1897/98); C.B. Clarke: 336 (1901/02) non *C. triqueter* Boeck.

C. halpan L. (haspan) var. *fasciculatus* Boeck.: 575 (1867/68).

var. **denudatus**. Figure 20G, J.

Icones: R.W. Haines & Lye: figs 319–321 (1983).

Vouchers: *Edwards 2257, 2390, 2429; K.D. Gordon-Gray 5006; Moll 1108, 1376* (PRE); *C.J. Ward 2068, 2911, 7131, 7234, 8796.*

Description: C.B. Clarke: 173 (1897/98); R.W. Haines & Lye: 169 (1983).

Distribution: widespread.

The typical variety of *C. denudatus* is well represented in Natal. Rhizomatous (rhizome often uniseriate, often more congested), bright green, rather soft-textured plants abundant in permanent water of swamps and streambanks, or less frequently in wet depressions in grassland. Culms 3-angled and winged, especially below anthelate inflorescence of neat, rather narrow, shining brown spikelets (occasionally imperfectly formed). These features together with short inflorescence bracts, crested anthers (3 per floret) and small achenes, 0.5–0.7 × 0.3–0.4 mm, make identification simple.

Kükenthal (1936) degraded *Cyperus sphaerospermus* Schrad. (1832b) to *C. denudatus* as var. *sphaerospermus.* This became known as the leafy expression of *C. denudatus.* Despite the relationship being close, it does not warrant varietal status and it is essential that *C.*

sphaerospermus be accepted as a distinct species (see No. 41).

The relationship of *C. denudatus* seems to be more with the widespread tropical *C. halpan* L. (often incorrectly **C. haspan*) which has not been recorded for Natal although it is present in Zimbabwe and almost certainly Mozambique.

Varietal status for the Natal plants is made necessary by the maintenance of other varieties within the species in tropical Africa and Madagascar.

10. **Cyperus difformis** *L.*, Centuria II plantarum: 6 (1756); L.: 302 (1759); L.: 67 (1762); Rottb.: 24 (1773); Kunth: 38 (1837); Steud.: 23 (1855); Boeck.: 586 (1867/68); C.B. Clarke: 290 (1883a); C.B. Clarke: 133 (1884); Ridl.: 137 (1884); C.B. Clarke: 556 (1894b); C.B. Clarke: 170 (1897/98); C.B. Clarke: 330 (1901/02); Schönland: 26 (1922); Kük.: 237 (1936); Podlech: 14 (1967); R.W. Haines & Lye: 165 (1983); P.L. Forbes: 43 (1987b). Type: from India.

C. complanatus Forssk.: 14 (1775).

C. oryzetorum Steud.: 24 (1855).

C. goeringii Steud.: 24 (1855). Type: from Java.

Icones: Rottb.: t. 9, fig. 2 (1773); Schönland: t. 13 (1922); R.W. Haines & Lye: figs 310, 311 (1983).

Vouchers: *Downing 562; Hilliard & B.L. Burtt 14471; K.D. Huntley 508; C.J. Ward 631, 2060, 5344.*

Description: C.B. Clarke: 170 (1897/98); R.W. Haines & Lye: 165 (1983).

Distribution: Coast, Midlands, N Natal, Zululand, Maputaland.

Introduced to South Africa, possibly with rice. In Natal, well represented in all areas except the Uplands. Soft annuals with dense inflorescences of closely-packed small spikelets with obtuse glumes, yellowish green to greyish to light brown in colour, overtopped by long bracts. Plants grow wherever water is available in disturbed natural vegetation. May also be weeds of cultivation. Considerable variability in plant size and robustness within a single locality is dependent upon habitat conditions. In water, large plants 600–800 mm high will bear branching anthelate inflorescences; within half a metre, on fringe of water body, plants may be only up to 200 mm high, each with a solitary culm bearing a contracted head, lacking, or with reduced, branches. Not yet a problem in Natal, but Tucker (1987) states that plants are capable of completing their life history in one month, each producing thousands of achenes. Germination is most prolific in shallow water, so that there is adaptation to growth in ground periodically flooded. The species is a menace in rice-growing areas of the East.

11. **Cyperus distans** *L. f.*, Supplementum plantarum: 103 (1781); Kunth: 93 (1837); Steud.: 49 (1855); Boeck.: 612 (1867/68); C.B. Clarke: 290 (1883a); C.B. Clarke: 144 (1884); C.B. Clarke: 558 (1893/94); C.B. Clarke: 178 (1897/98); C.B. Clarke: 349 (1901/02); Schönland: 27 (1922); Kük.: 137 (1935); Kern: 610 (1974); R.W. Haines & Lye: 200 (1983). Figure 20H, K.

Note: pantropical in distribution. Extremely variable and no attempt is made here to consider synonyms nor infraspecific taxa. The species also offers difficulty because of irregularities in the breaking up of spikelets. This has meant that some phases of the species have been placed in *Cyperus*, others in *Mariscus–M. keniensis* (Kük.) S.S. Hooper, based on *Cyperus keniensis* Kük.: 306 (1925), the type from Kenya; *M. longibracteatus* Cherm.: 407 (1919b), the type from Madagascar; *M. rubrotinctus* Cherm.: 407 (1919b) the type from Madagascar. In this work these entities are all included in the interpretation of *C. distans s.l.*

Icones: Schönland: fig. 16 (1922).

Vouchers: *Cadman et al. 3258 (M. keniaeensis); B.J. Huntley 650; Tinley 604; C.J. Ward 1962, 6162.*

Description: C.B. Clarke: 178 (1897/98).

Distribution: Coast, Midlands, Zululand, N Natal, Maputaland.

In Natal the species is probably much more frequent than collections indicate. Plants described as perennials producing stolons, but many flower during the first year and appear as medium-sized annuals, 0.5–0.75 m high, with a solitary trigonous culm invested basally by 3-ranked sheaths bearing blades that are green adaxially, glaucous abaxially. Inflorescences anthelate, delicate and diffuse, with long spikelets easily recognised because of distantly arranged glumes, each with obtuse membranous apex to which midvein does not reach, and wide membranous margins. Plants grow commonly in damp, shaded situations along river and streambanks, on margins of temporary pools and roadside ditches and as weeds of cultivation. With onset of unfavourable conditions there is dieback of aerial parts with eventual production of stolons and several shoots, whereas there had been but one the previous season.

Vorster (1978a) maintains *M. keniensis* as distinct from *C. distans* and states that the former taxon is almost always found (in southern Africa) in association with cultivated plantations (mostly *Pinus* spp.), the plants growing in wet soil along streambanks and in seepage areas in glades exposed to partial or full sunlight. Many such plants have yellowish culms and dark brown spikelets, much darker than those of *C. distans*.

12. **Cyperus dives** *Delile*, Florae aegyptiacae illustratio: 5, t. 4, fig. 3 (1813); Kunth: 71 (1837); Steud.: 36 (1855); A. Rich.: 480 (1851); C.B. Clarke: 293 (1883a); Ridl.: 142 (1884); Kük.: 68 (1935); R.W. Haines & Lye: 180 (1983). Type: from Egypt. Figure 20I, L.

C. alopecuroides C. Presl var. *dives* (Delile) Boeck.: 321 (1869/70).

C. exaltatus Retz. var. *dives* (Delile) C.B. Clarke: 187 (1884); C.B. Clarke: 561 (1894b); C.B. Clarke: 370 (1901/02); Rendle: 119 (1899).

C. immensus C.B. Clarke: 294 (1883a); C.B. Clarke: 565 (1894b); C.B. Clarke: 184 (1897/98); C.B. Clarke: 371 (1901/02); Schönland: 28 (1922); Kük.: 67 (1935). Type: from Madagascar (?).

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* See addendum.

Icones: Delile: t. 4, fig. 3 (1813); Schönland: t. 19 (1922) as *C. immensus*; R.W. Haines & Lye: figs 344, 345 (1983).

Vouchers: *Edwards 2557; B.J. Huntley 681; Moll 2581* (PRE); *C.J. Ward 1788, 5233, 8589.*

Description: C.B. Clarke: 184 (1897/98) as *C. immensus*; R.W. Haines & Lye: 180 (1983).

Distribution: Coast, Midlands, Zululand, Maputaland.

C. dives is one of the larger Natal sedges. Plants numerous, occurring in reed swamps, moist depressions and along riverbanks and streamlet margins. Clearance of natural vegetation near water courses at the coast for planting of sugar cane has greatly increased the frequency of this species, plants of which are a natural host for the indigenous moth, *Eldana saccharina* Walker. Under certain circumstances this insect will transfer to sugar cane where the larvae have already caused concern and loss to the sugar industry.

In Natal, plants of *C. dives* are often confused with a similar looking, often sympatric species, *C. latifolius*. This is unnecessary as the two taxa are not close relatives and are easily distinguished by careful observation. Their main differences are summarised.

*C. dives**

Rhizome short, sympodial, often almost vertical. Leaf blades and inflorescence bracts with scabrid margins. Radioli (ultimate inflorescence branches that carry spikelets) smooth, glabrous. Glumes greenish yellow to golden, with excurrent greenish midribs in life (pallid to golden when dry). Achenes elliptical (apex and base symmetrical and difficult to distinguish, both truncate and darker in colour), surface smooth, mostly pale grey.

C. latifolius (see No. 21)

Underground stem base abbreviated, hard, producing elongate 3–4 mm wide stolons with dark scale leaves. Leaf blades and inflorescence bracts with smooth margins. Radioli scabrid. Glumes brown with uncoloured almost membranous margin, apex obtuse, midribs not excurrent. Achenes elliptic to obovate (apex beaked, more slender than trigonous base), surface minutely papillate, brown or dark brown at maturity. Plants are not hosts to *Eldana saccharina.*

13. **Cyperus elephantinus** *C.B. Clarke* in Conspectus florae africae 5: 559 (1894b) name only; Kük.: 51 (1935) description. Syntypes: Natal, without precise locality, *Buchanan 113, 320* (K).

Mariscus elephantinus (C.B. Clarke) C.B. Clarke: 195 (1897/98).

Icones: C.B. Clarke: t. 20, figs 1, 2 (1909) as *Mariscus elephantinus*.

Description: C.B. Clarke: 195 (1897/98) as *Mariscus elephantinus.*

Plants that agree with Buchanan's syntypes have not been re-collected, nor as far as is known, seen again. Records at Kew show that *Buchanan 320* (a large inflorescence only) was received in November 1875 and probably came from the region of the Umpumalo (Mapumulo) Mission, 30 miles inland on the Tugela River watershed where Buchanan stayed for eighteen months in 1874/5. *Buchanan 113* was treated as a duplicate by Kew: it may have been a second sending of the same collection from a parcel sent in 1883 with numbers beginning again at 1 (Buchanan was then in England and the parcel sent from his English address–S.S. Hooper 1965 pers. comm.).

The identity of Buchanan's plant is not really established, for no basal organs are known. Both floristic and anatomical evidence (Kükenthal 1935; Vorster 1978a) point to its relationship with *C. papyrus*. Was it perhaps a spontaneous hybrid from *C. papyrus*? (A putative hybrid of *C. papyrus* from the Transvaal, *Scheepers 1250* PRE, is comparable, but not identical). If this is the answer, then there is a problem of distributional range. *C. papyrus* is not at the present time known naturally from as far south as Buchanan's inferred locality. Was it present there in 1875? It seems more probable that Buchanan travelled to areas where *C. papyrus* was established and there collected *Buchanan 320* (see also under Hybrid catalogue, p. 206).

14. **Cyperus eragrostis** *Lam.*, Tableau encyclopédique et méthodique des trois règnes de la nature. Botanique 1: 146 (1791) non Vahl; Kük.: 178 (1936); P.L. Forbes: 44 (1987b). Type: from America.

C. vegetus Willd.: 283 (1797); Kunth: 40 (1837); Steud.: 24 (1855); Boeck.: 550 (1867/68); C.B. Clarke: 115 (1884); C.B. Clarke: 11 (1901/02).

Voucher: *Wells 1023.*

Description: Kük.: 178 (1936).

Distribution: Coast (?), Midlands (Nagel Dam).

Leafy perennials (often annual?), very variable in size and in extent of branching of inflorescence depending, it would seem, on habitat conditions. The specific name relates to the form of the spikelet that bears resemblance to those of *Eragrostis* Wolf (Poaceae). These are broad, compressed, green in life, pallid when dry, closely clustered into a sessile head that may be accompanied by additional heads, either clearly pedunculate as rays, or reduced to form an aggregated cluster. Glume with central green zone forming fairly wide keel; flanks delicate and semi-transparent. Stamens 1 or 2 per floret, usually only one.

Native to Pacific Coast of USA and to temperate South America. Naturalised in other parts of North America and in southern Europe. In Natal it is adventive, growing in disturbed (often fallow) areas as a weed. There are many synonyms, only one of which seems to have been applied to the species in Natal.

15. **Cyperus esculentus** *L.*, Species plantarum, edn 1: 45 (1753); L.: 67 (1762); Kunth: 61 (1837); Steud.: 34 (1855); Boeck.: 287 (1869/70); C.B. Clarke: 178 (1884); C.B. Clarke: 559 (1894b); C.B. Clarke: 180 (1897/98); C.B. Clarke: 355 (1901/02); Kük.: 116 (1935); Podlech:

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* See addendum.

14 (1967); R.W. Haines & Lye: 190 (1983); P.L. Forbes: 44 (1987b). Type: from Germany (?). Figure 21A, D.

Icones: Kük.: fig. 14 (1935); R.W. Haines & Lye: figs 372, 373 (1983); Vanden Berghen: fig. 124 (1988).

Vouchers: *J. Browning 194; Edwards 1683; C.J. Ward 607, 2809, 4851, 6454, 6455.*

Description : C.B. Clarke: 180 (1897/98); R.W. Haines & Lye: 190 (1983).

Distribution: widespread.

C. esculentus (yellow nut sedge; water-grass; uintjies) is widespread throughout the world, except in Malaysia where it is uncommon. Favours temperate rather than tropical climates, and like its relative *C. rotundus* L. (red nut sedge; purple nut-grass), which is better adapted to the tropics, has become a serious weed of cultivation. Both species develop wiry lateral stolons that terminate in small tubers. Underground parts are main organs of reproduction, seed being unimportant (*C. esculentus* is reported as self-incompatible, Horak & Holt 1986). Tubers have greater resistance to herbicides than is usual for herbaceous plants. In America, Horowitz (1972) reported that in two months, a single tuber could produce a population covering from 2–4 m^2. The tubers are edible (chufa nuts). The species has many synonyms (not listed, as they have not been commonly applied in South Africa) and many varieties (not dealt with here as they are mostly unfamiliar).

In Natal, the species is ubiquitous as a weed of cultivation. Stolons penetrate storage organs of ground crops, particularly potatoes, to be followed by tuber formation in the potatoes. Plants in flower easily recognised by golden, anthelate inflorescence with spikelets spicate on rays. Both spikelets and glumes persistent (characteristic also of *C. rotundus*, but not of other Natal *Cyperus* spp.). Glumes with obtuse, membranous apex; flanks 3–4-nerved, veins well marked, fairly close to one another, fading before the quite well-marked almost membranous margin. Young plants generally yellowish green rather than the bluish green of *C. rotundus*, but the two species do not often grow together (see also No. 33, where differences are summarised).

*16. **Cyperus fastigiatus** *Rottb.*, Descriptionum et iconum rariores et pro maxima parte novas plantas illustrantium liber primus: 32 (1773); Boeck.: 311 (1869/70); C.B. Clarke: 561 (1894b); C.B. Clarke: 183 (1897/98); Kük.: 62 (1935); P.L. Forbes; 44 (1987b). Type: uncertain. Figure 21B, E.

C. fastigiosus L. in J.F. Gmel.: 134 (1791).

C. flabellaris Nees: 519 (1832); Nees: 137 (1835); Kunth: 69 (1837); Steud.: 40 (1855).

C. egregius Kunth: 69 (1837); Hochst.: 754 (1845). Type: *Drège (?).*

C. semiangulatus Boeck.: 367 (1874).

Icones: Rottb.: t. 7, fig. 2 (1773).

Vouchers: *Edwards 2391, 2417; Hilliard & B.L. Burtt 19032; Moll 4549; C.J. Ward 471, 2098, 2855, 4567, 7282,; M.C. Ward 1577; West 909* (PRE).

Description: C.B. Clarke: 183 (1897/98).

Distribution: Coast, Midlands, Uplands, Zululand, Maputaland, Kokstad area.

Characterised by its sympodial, non-stoloniferous rhizome clothed in reddish brown scale leaves; culms, often taller than 1 m, sharply triangular to winged below inflorescence; leaves 6–8(–10) mm wide, often as long as culms, glaucous abaxially with scabrid margins; inflorescence anthelate, spikelets spicate on rays, usually suberect; glumes golden brown to reddish brown with membranous margin, abscising to leave spirally twisted wings on rachilla.

In Natal, plants usually abundant. Occur in vleis in permanent water, or towards the margins where rhizomes are periodically inundated. Seed is produced in quantity and germinates readily and quite rapidly under water, or under a regime of periodic inundation. Further study is required. In southern Natal, Cape and OFS, rhizomes lack conspicuous scale leaves and are more elongate. Two elements may be represented.

C. fastigiatus is very closely related to the tropical *C. digitatus* Roxb. subsp. *auricomus* (Sieber) Kük.

17. **Cyperus haematocephalus** *Boeck.* (Mss. in herb. Schinz) ex C.B. Clarke in Conspectus florae africae 5: 564 (1894b) name only; C.B. Clarke: 171 (1897/98); Kuntze: 333 (1898); Kük.: 237 (1936); P.L. Forbes: 44 (1987b). Syntypes: Transvaal, Hooghe Veld, *Rehmann 6779, 6783* (K). Orange Free State, *Buchanan 124* (K). Natal, Biggars Berg, 5000 ft, *Kuntze 241* (K); Hilton Road, *Schlechter 6767* (PRE). Transkei, Umtata, *Schlechter 6356* (K). Figure 21C, F.

Vouchers: *Acocks 10229* (PRE); *T.H. Arnold 404* (PRE) *862, 871; J. Browning 182; Schlechter 6767* (PRE).

Description: C.B. Clarke: 171 (1897/98).

Distribution: Midlands, Uplands.

Plants slender, leaf-bearing perennial (sometimes annual?) herbs up to 0.8 m high growing in seepages in grassveld. Slender culms, triquetrous apically, carry open anthelate inflorescences comprising a sessile globose head accompanied by (1–)4–6-rayed globose heads. Compressed, greenish brown to dark greyish brown spikelets closely congested, 8–12-flowered, with glumes regularly and closely imbricated. Glume apex terminates in minute recurved mucro. This dainty glume tip, the globose inflorescence units, and spikelet coloration make indentification simple. No other Natal sedge should readily be confused with *C. haematocephalus*. Depauperate plants may bear a single globose head-like inflorescence without rays.

18. **Cyperus imbricatus** *Retz.*, Observationes botanicae sex fasciculis comprehensae 5: 12 (1788); Kük.: 69 (1935); Podlech: 15 (1967); Kern: 603 (1974); R.W. Haines & Lye: 180 (1983). Type: India, *Koenig s.n.* (LD). Figure 21G, J.

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* See addendum.

C. radiatus Vahl: 369 (1805); Kunth: 71 (1837); Steud.: 37 (1855); Boeck.: 317 (1869/70); C.B. Clarke: 185 (1884); Ridl.: 142 (1884); C.B. Clarke: 573 (1894b); C.B. Clarke: 369 (1901/02).

C. involucratus Poir.: 253 (1806) non Rottb. (1772).

Icones: Kük.: fig. 9G–J (1935); R.W. Haines & Lye: figs 346, 347 (1983); Vanden Berghen: fig. 127 (1988).

Vouchers: *Pooley 365a; Tinley 567; Ward & Farquharson 10026, 10027, 10028*.

Description: R.W. Haines & Lye: 180 (1983).

Distribution: Maputaland.

Widespread in tropical areas. There are many additional synonyms not listed here. Kern (1974) reported the species as 'highly polymorphous'. This is applicable to plants growing in Maputaland, where microhabitat conditions have pronounced effect upon their height and robustness. The sequence *Ward & Farquharson 10026–10028* shows this range, for the plants vary from tall (600 mm) to short (150 mm) with culms robust (2.0 mm in diameter) to slender (0.3 mm in diameter)—all plants collected at the same time from the margin of a freshwater pan, in organically rich silt, ranging outward from favourable to less favourable conditions and affected in degree by competition with associated species.

In Natal plants always less robust and softer than those of the similar-looking *C. dives* (No. 12). Spikelets also more appressed against axis of spike. Glumes shorter (0.9–1.2 mm long; 1.2–1.8 mm in *C. dives*), more closely overlapping in the spikelet and with a more pronounced mucro). There is also relationship with the tropical *C. exaltatus* Retz., perhaps an older synonym. Types are still to be compared. Where *C. imbricatus* is locally abundant it is relished by hippo.

19. **Cyperus iria** *L.*, Species plantarum, edn 1: 45 (1753); L.: 67 (1762) excl. tab. Rheed.; Kunth: 38 (1837); Steud.: 23 (1855); Boeck.: 595 (1867/68); C.B. Clarke: 137 (1884); C.B. Clarke: 565 (1894b); C.B. Clarke: 346 (1901/02); C.B. Clarke: 213 (1903); Kük.: 150 (1935); Kern: 616 (1974); R.W. Haines & Lye: 198 (1983). Type: India, *Osbeck s.n.*

Chlorocyperus iria (L.) Rikli: 564 (1895).

Icones: R.W. Haines & Lye: figs 391, 392 (1983); Vanden Berghen: figs 130, 131 (1988).

Voucher: *Downing 688*.

Description: R.W. Haines & Lye: 198 (1983).

Distribution: Zululand.

Widespread in tropical Asia, Iran, Afghanistan, China, Japan and Australia, also tropical east Africa from where it has probably spread to Zululand. It might, however, be an introduction there. At present the species is localised in Natal, but holds menace in that it is a potential weed of cultivation, especially rice cultivation. It is adventive in all tropical and temperate regions of the Americas.

Plants annual (short-lived perennials under favourable habitat conditions), very variable in size and robustness, from slender single-stemmed short herbs, to tussocky very much stronger examples with culms up to 0.5 m high. Inflorescence also varies greatly in size and branching (from a compound anthela to a congested head) as does the number of florets to a spikelet. Identification is not difficult because of the golden inflorescence (pallid when dry), comprising ascending-appressed loose spikelets with laxly arranged (scarcely imbricated) 3-nerved, orbiculate glumes, each minutely notched below the diminutive mucro.

Tucker (1987) reports the plants as cleistogamous with the filaments elongating only sufficiently to bring the tiny anthers into contact with the short stigmas that remain within the glumes at anthesis. The anthers frequently agglutinate to the stigmas.

20. **Cyperus laevigatus** *L.*, Mantissa plantarum 2: 179 (1771); Rottb.: 19 (1773); Steud.: 12 (1855); Boeck.: 486 (1867/68) var. *albidus*; C.B. Clarke: 282 (1883a); C.B. Clarke: 77 (1884); Ridl.: 128 (1884); Kük.: 321 (1936); R.W. Haines & Lye: 264 (1983). Type: South Africa, *Koenig s.n.* Figures 21I, L; 22.

Pycreus laevigatus (L.) Nees: 130 (1835). *Juncellus laevigatus* (L.) C.B. Clarke: 596 (1893/94); C.B. Clarke: 544 (1894b); C.B. Clarke: 161 (1897/98); C.B. Clarke: 308 (1901/02); Rendle: 109 (1899); Schönland: 23 (1922); Podlech: 28 (1967).

Icones: Rottb.: t. 16, fig. 1 (1773); C.B. Clarke: t. 3, figs 20, 21; t. 4, fig. 33 (1884); Schönland: t. 9 (1922); R.W. Haines & Lye: fig. 539 (1983); Vanden Berghen: fig. 132 (1988).

Vouchers: *Dutton 21; Pooley 2183; M.C. Ward 1578* (PRE); *C.J. Ward 265, 1271*.

Description: C.B. Clarke: 161 (1897/98) as *Juncellus laevigatus*; R.W. Haines & Lye: 264 (1983).

Distribution: Coast, Midlands (along streambanks), Maputaland.

Pantropic in distribution. Plants are variable morphologically, so it is not surprising there are many synonyms and many varieties (only the best known synonyms are listed here and no varieties, as the Natal plants are fairly uniform and typical). Reduction of all the inflorescences on a plant, each to a solitary, more or less erect spikelet is not known for Natal, but is frequent in tropical Africa. Such reduction alters the overall facies of the species quite markedly.

In Natal, *C. laevigatus* is an early colonizer of sandy alluvium, plants forming local stands along margins of lagoons, in estuarine backwaters, and in damp areas along seashore. There is tolerance to salinity. There are records from as far inland as Muden (*Ram s.n.*) where plants occur along rivers.

Culms either close-packed on contracted rhizome giving a tufted appearance, or solitary at intervals on an elongate monopodial rhizome that produces roots at intervals along its length, not only where culms develop. Leaves always reduced to sheaths. Inflorescences pseudolateral heads of several to few to occasionally one, neat straw-coloured spikelet(s), subtended by stiff (often short) bract continuing in line of culm. Style branches 2, not 3 as in most other species of *Cyperus*. Achenes irregularly biconvex (flat adaxially, rounded abaxially). These features characterize *Juncellus* C.B. Clarke, a genus now incorporated within *Cyperus*, and should not be confused with *Pycreus* P. Beauv. where style branches are also two, but the biconvex achene is placed edge-on to the rachilla and flattened in the plane of the spikelet (see Figure 61).

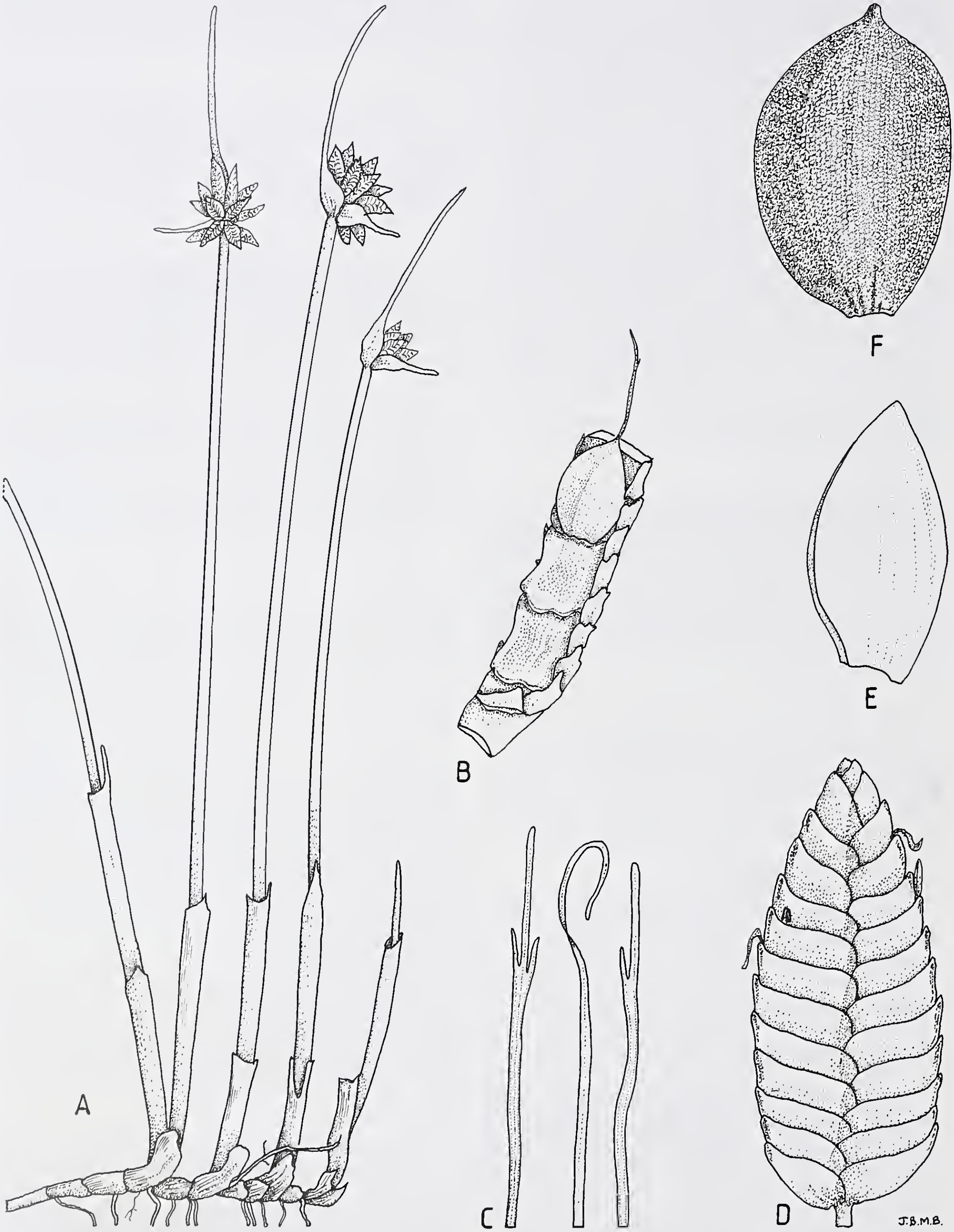

FIGURE 22.—*Cyperus laevigatus*, *Pooley 2183*. A, plant, × 1; B, rachilla, with glumes removed: one young achene shown recessed into cavity of the rachilla, × 23; C, style and style branches: variation within one spikelet, × 25; D, spikelet, × 10; E, glume, lateral view, × 16; F, achene, × 29.

21. **Cyperus latifolius** *Poir.* in Encyclopédie méthodique, Botanique 7: 268 (1806); Kunth: 75 (1837); Steud.: 38 (1855); Boeck.: 602 (1867/68); C.B. Clarke: 291 (1883a); C.B. Clarke: 152 (1884); C.B. Clarke: 565 (1894b); C.B. Clarke: 177 (1897/98); C.B. Clarke: 351 (1901/02); K. Schum.: 120 (1895); Kük.: 87 (1935); R.W. Haines & Lye: 182 (1983); P.L. Forbes: 44 (1987b). Type: Madagascar, *Du Petit-Thouars s.n.* (P). Figure 23A, D.

C. labiatus Peter: 112 (1928).

Icones: Kük.: fig. 11 (1935); R.W. Haines & Lye: figs 350, 351 (1983).

Vouchers: *J. Browning 160; C.J. Ward 620, 3644, 5232; M.C. Ward 2271.*

Description: C.B. Clarke: 177 (1897/98); R.W. Haines & Lye: 182 (1983).

Distribution: Coast, Midlands, Zululand, Maputaland.

Within *C. latifolius* Kükenthal (1935) recognised five varieties and for three of these cited specimens from Natal:

var. *latifolius*: *J.L. Dickson s.n.* (Ngoma swamps).

var. *angustifolius* Hochst.: 754 (1845); C.B. Clarke: 566 (1894b); C.B. Clarke: 178 (1897/98): more slender in all its parts; leaves 6–8 mm wide: *Krauss 211* (Umlaas River); *Buchanan 110* (without precise locality).

var. *austro-africanus* Kük.: 88 (1935) sensu C.B. Clarke: 177 (1897/98) non Poir.: *Herb. Schinz n. 7615* (Umlaas River); *Wood 5808* (Durban); *R.E. Fries & Th. C.E. Fries 3255* (Durban); *Buchanan 115* (without precise locality). Plants with large inflorescences (radioli up to 30 mm long): glumes densely imbricate, broadly ovate, barely involute at margins, obsoletely nerved, often purplish.

This gives an impression of wide variability within Natal plants, but to the fieldworker, such a structural range is not apparent. In the present work no infraspecific categories are recognised as Kükenthal's cited specimens have not been studied in relation to what is known of *C. latifolius* in eastern southern Africa.

Plants occur in freshwater swamps and along river and streamlet margins and in local wet depressions in grassland. Characters by which identification is most readily made are summarised under *C. dives* (No. 12), with which species there is sometimes unnecessary confusion.

22. **Cyperus longus** *L.*, Species plantarum, edn 1: 45 (1753); L.: 67 (1762); Kunth: 60 (1837); Steud.: 34 (1855); Boeck.: 279 (1869/70); C.B. Clarke: 163 (1884); C.B. Clarke: 567 (1894b); C.B. Clarke: 182 (1897/98); C.B. Clarke: 366 (1901/02); Kük.: 97 (1935); R.W. Haines & Lye: 189 (1983); P.L. Forbes: 44 (1987b). Type: from southern Europe.

C. fenzelianus Steud.: 33 (1855); C.B. Clarke: 368 (1901/02).

Note: *C. longus* has been much confused with *C. rotundus* L. and there are many references in the literature to this close relationship, such as Clarke (1901/02); Schönland (1922); R.W. Haines & Lye (1983). However, Clarke (1897/98) states '*C. longus* is generally separated from *C. rotundus* by the stem decumbent at the base, passing into an equally thick, scarcely tuberous rhizome;'. *C. longus* is also reported as ' ... a very polymorphic species ...' (Haines & Lye 1983). In how far this polymorphy is the outcome of including elements that do not really belong within the species, requires careful appraisal. In the meantime many infraspecific taxa (at both subspecific and varietal level, but mostly the latter) have been recorded. In the present treatment *C. longus* is accepted as clearly distinct from *C. rotundus*: in Natal the former is a plant of the natural vegetation; rather uncommon, never a weed (but unfortunately sometimes treated as one!); the latter is the problematic weed difficult to eradicate from areas of cultivation. Two varieties are accepted, the typical one and var. *tenuiflorus* (Rottb.) Boeck. These are given subspecific ranking by Kükenthal (1935), but in view of the poor knowledge of *C. longus* in Natal, it seems prudent, at this stage, to assume that the two phases of the species (if both do occur in Natal: this needs confirmation) may occupy a common distributional area.

var. **longus**

Vouchers: *Brayshaw 60; K.D. Gordon-Gray & Frankish 2/57MK; K.D. Huntley 256; Taylor 286; C.J. Ward 2719.*

Distribution: Midlands.

In Natal, plants robust, stoloniferous perennials with 3-angled culms 600–800 mm high. Leaf blades several to each shoot, 7–10 mm wide with 2 major veins running parallel with midrib. Inflorescences compound or simple anthelas carrying rich dark brown, linear spikelets overtopped by leaf-like bracts, lowest up to 200 mm long. Neither culm bases, nor stolons are sufficiently thickened to be described as 'tuberous', but this needs confirmation by field study over a period of years, as thickening may only take place late in the growth cycle when reserves have been accumulated.

Plants occupy shallow, periodically inundated depressions in grassland, usually rooted where water is deepest.

var. *longus* is most easily identified by long, linear fairly wide spikelets (11–22 × 1.5–2.0 mm) numerous and dense on inflorescence rays; softly textured dark glumes that give a 'heavy' handsome look to the inflorescence and scarcely swollen stolons and culm bases. Kükenthal (1935) limited this entity (as subsp.) to southern Europe and the Mediterranean.

var. **tenuiflorus** *(Rottb.) Boeck.*: 281 (1869/70); C.B. Clarke: 567 (1894b) p.p.; C.B. Clarke: 182 (1897/98); C.B. Clarke: 366 (1901/02) excl. syn. *C. badius* Desf.; Schönland: 28 (1922); R.W. Haines & Lye: 190 (1983). Type: (?) Iconotype, Rottb.: t. 14, fig. 1 (1773). Figure 23C, F.

Cyperus tenuiflorus Rottb.: 30 (1773). *C. longus* L. subsp. *tenuiflorus* (Rottb.) Kük.: 102 (1935); Podlech: 15 (1967).

C. amoenus Kunth: 58 (1837).

Icones: Schönland: t. 18 (1922).

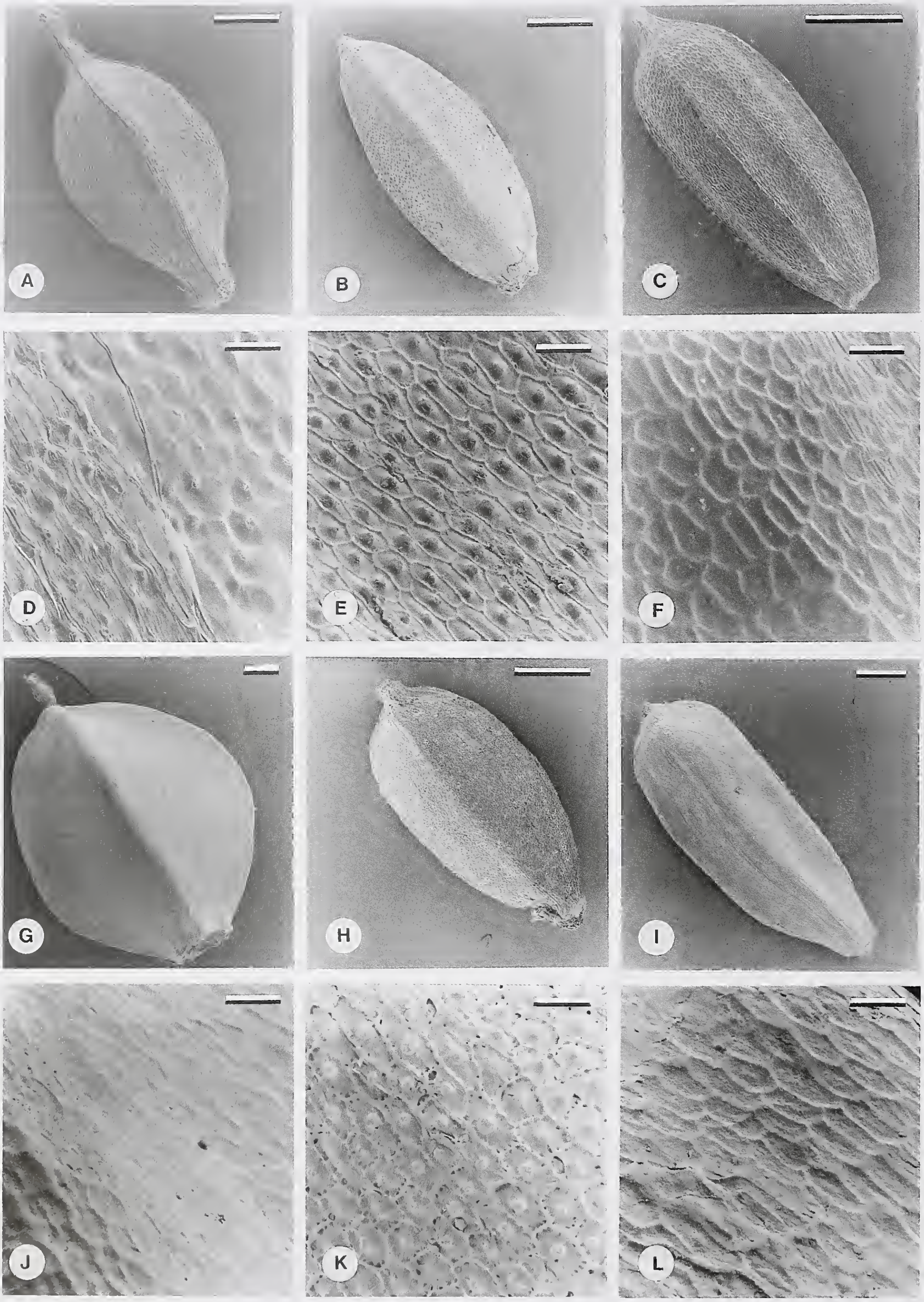

FIGURE 23.—*Cyperus*. A, D, *C. latifolius*, *J. Browning 160*; B, E, *C. leptocladus*, *Forbes 398*; C, F, *C. longus* var. *tenuiflorus* (not Natal), *Meyer s.n.*; G, J, *C. margaritaceus*, *Moll 4896*; H, K, *C. marginatus*, *Physick 79*; I, L, *C. natalensis*, *J. Browning 164*. Scale bars: A–C, G–I, 250 µm; D–F, J–L, 25 µm.

Description: C.B. Clarke: 182 (1897/98).

Note: this variety has not yet been recorded for Natal with certainty. It is included as its distribution is reported for South Africa by Schönland (1922) as '... in all but the driest parts, though its occurrence seems to be rather patchy everywhere.' It is well reported for the eastern Cape, the Orange Free State and the Transvaal. Kükenthal (1935) (as subsp.) cited *Krauss 189* (Umlaas River); *Wahlberg s.n.* (Pietermaritzburg) for Natal, neither of which have been seen.

Plants of var. *tenuiflorus* differ from those of the typical variety in their somewhat reduced size (culms 300–600 mm; leaf blades 3–4 mm wide, somewhat glaucous, only midrib well-marked; shorter, narrower spikelets (8–12 × 1.0–1.2 mm), less numerous at tips of inflorescence rays; firmer, chartaceous, smaller, paler brown glumes usually with yellowish midrib, giving the whole inflorescence a daintier, neater, less handsome appearance.

One gathering from Natal (Maputaland), *Musil 18* (PRE), has been named *Cyperus maculatus* Boeck. This species differs from *C. longus* by the glumes which have a wide hyaline margin (in *C. longus* this uncoloured membranous edge is narrow). As far as is known there are no other records in herbaria or in the literature for *C. maculatus* from Natal, so Musil's gathering is listed under *C. longus*, pending further study. See also *C. rigidifolius*, No. 32.

23. **Cyperus margaritaceus** *Vahl*, Enumeratio plantarum 2: 307 (1805); Kunth: 46 (1837); Steud.: 28 (1855); Boeck.: 529 (1867/68); Ridl.: 133 (1884); C.B. Clarke: 110 (1884); C.B. Clarke: 568 (1894b); C.B. Clarke: 169 (1897/98); C.B. Clarke: 321 (1901/02); Rendle: 112 (1899); Kük.: 284 (1936); P.L. Forbes: 45 (1987b). Type: Guinea, *Thonning s.n.* (C). Figure 23 G, J.

var. *margaritaceus*

Icones: R.W. Haines & Lye: fig. 519 (1983).

Description: Kük.: 284 (1936); R.W. Haines & Lye: 257 (1983).

Plants strongly but shortly rhizomatous, tufted, leafy, rather stiff perennials growing in open woodland, scrubland or grassland, usually on sand. Clarke (1901/02) states that the typical form is rare in South Africa, but Kükenthal (1936) cites for that country, without precise locality, *Zeyher 175; Marloth 1022* (both also cited by Clarke 1897/98) and *Wahlberg s.n.*

var. *pseudonivea (pseudoniveus)* (Boeck.) C.B. Clarke: 322 (1901/02); Kük.: 284 (1936). Type: South West Africa (Namibia) Amboland, Olukonda, *Schinz 376*.

C. pseudoniveus Boeck.: 45 (1887).

Differs from the typical phase in greater number of spikelets of inflorescence (5–20; 2–7 in typical variety). Clarke (1901/02) reports var. *pseudonivea* as 'frequent in South Africa'. Kükenthal (1936) cites *Schlechter 11591* from Mozambique and other specimens from Namibia, but there are no records given for Natal by either author.

C. margaritaceus sensu lato is distributed from West Africa through central Africa to Namibia and South Africa. Four varieties, in addition to those given above, are recorded by Kükenthal (1936). Of these, Haines & Lye (1983) list two. Infraspecific differences are based mainly on leaf width and number of spikelets of inflorescence, but nowhere are the varietal characteristics clearly defined. In its wide sense it is a very variable entity, made the more difficult to interpret taxonomically by its close relationship with *C. obtusiflorus*, with which it is sympatric over wide areas of the distributional range. Clarke (1901/02) remarks that he sees no good line between *C. margaritaceus* var. *pseudonivea* and [*C. compactus*] = *C. obtusiflorus*.

Vouchers: *Downing 435; Edwards 3029; Moll 4896; C.J. Ward 687, 7249, 8181.*

Distribution: North Coast, Zululand, Maputaland.

In Natal, plants fairly frequent in open grassland, palm veld and in *Acacia burkei* woodland, usually in sand. In young stages of growth often difficult to distinguish with certainty from young plants of *C. obtusiflorus* (No. 26). At maturity, the most convincing distinctions are summarised below. Habitat differences are not of much account, since plants of both species may grow in close proximity. It is not known whether intermediates exist (they would be difficult to recognize as such!), but in the literature for tropical Africa it is implied that some of the variability reported for *C. margaritaceus* may owe its origin to genetic exchange with *C. obtusiflorus*.

Natal plants have not been critically studied and no attempt is made to place them varietally. A continental study of *C. margaritaceus, C. obtusiflorus* (No. 26) and *C. sphaerocephalus* (No. 40) is needed.

C. margaritaceus

Plants with rhizome not markedly uniseriate, giving a somewhat tufted appearance to shoots. Inflorescences of up to 20 spikelets; these not very markedly compressed. Fully mature achenes 2.2–3.0 × 1.7–2.0 mm.

C. obtusiflorus

Plants with rhizome usually uniseriate, the sequence of shoot bases closely approximated one to another. Leaves and culms faintly bluish green. Inflorescences of up to 45 compressed spikelets. Fully mature achenes 1.3–2.0 × 1.0–1.3 mm.

C. sphaerocephalus distinguished from both the above by its deep golden glumes and robust, short growth form with well-marked uniseriate rhizome. But there are much more slender, often taller examples with pale lemon-yellow glumes. Spikelet number and achene size fit with *C. margaritaceus* better than with *C. obtusiflorus*.

24. **Cyperus marginatus** *Thunb.*, Prodromus: 18 (1794); Thunb.: 100 (1823); Boeck.: 571 (1867/68); Ridl.: 136 (1884); C.B. Clarke: 568 (1894b); C.B. Clarke: 173

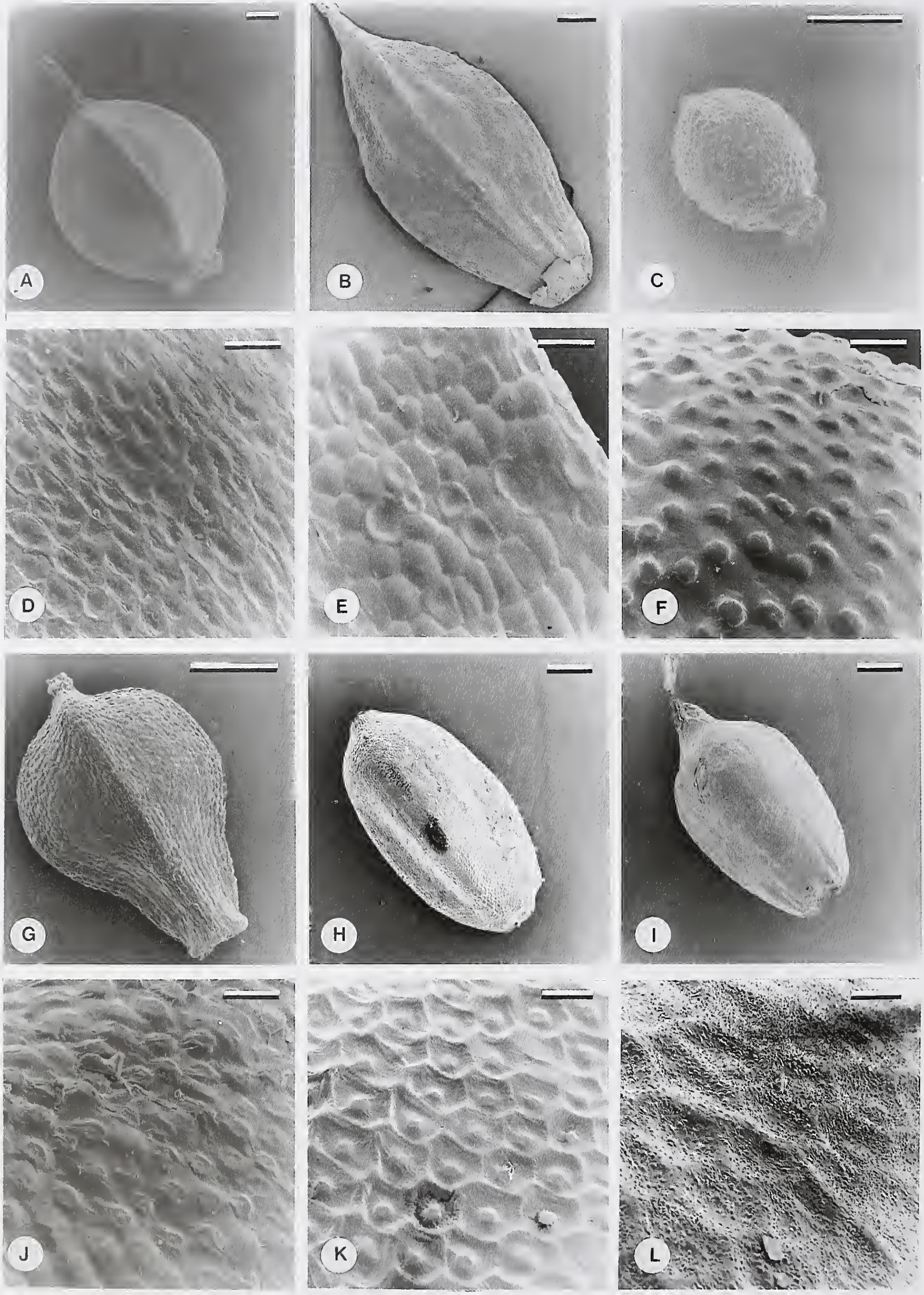

FIGURE 24.—*Cyperus*. A, D, *C. obtusiflorus, De Jager s.n.*; B, E, *C. pectinatus, Ward 7476*; C, F, *C. prolifer, J. Browning 212*; G, J, *C. remotiflorus, Schweickerdt 2140*; H, K, *C. rotundus* subsp. *rotundus, Ward 749*; I, L, *C. rotundus* subsp. *tuberosus, T.H. Arnold 100*. Scale bars: A–C, G–I, 250 µm; D–F, J–L, 25 µm.

(1897/98); C.B. Clarke: 339 (1901/02); Kük.: 188 (1936); Podlech: 16 (1967); R.W. Haines & Lye: 264 (1983); P.L. Forbes: 45 (1987b); Hilliard: 53 (1987). Type: South Africa, without locality, *Thunberg s.n.* (UPS). Figure 23H, K.

C. prolifer Nees: 494 (1832) p.p. non Lam.

C. fonticola Kunth: 36 (1837); Steud.: 22 (1855). Type: Cap. b. spei (Klein-Namaqualand in proximitate fl. Garip) *Drège* (?).

C. prionodes Steud.: 22 (1855).

C. brunneo-vaginatus Boeck.: 407 (1890a); C.B. Clarke: 550 (1894b).

Icones: R.W. Haines & Lye: figs 537, 538 (1983).

Vouchers: *Basel 67; Edwards 2036, 2058, 2346; Killick 1809; Physick 79; C.J. Ward 8018; Wells 1208.*

Description: C.B. Clarke: 173 (1897/98); R.W. Haines & Lye: 264 (1983).

Distribution: Midlands, Uplands.

C. marginatus is a widely distributed species in southern Africa with some variability in details of form, (for example plants from Namibia are very much harder in texture and often more compact than those from Natal). Nevertheless, there are criteria that collectively permit fairly easy identification. Fairly stout (5–7 mm wide), well-developed, horizontal rhizome bears rounded culms clothed basally in persistent sheaths. Leaf blades reduced, occasionally blade of uppermost sheath slightly prolonged. Inflorescence a branched anthela (sometimes reduced to a head). Spikelets digitately arranged (often some solitary), compressed, glossy red-brown, subtended by short bracts. Glumes minutely mucronate.

In Natal, plants up to about 0.8 m tall are common along streambanks, usually rooted in shallow water, often among rocks; sometimes they border isolated small pools.

Kükenthal (1936) recognised var. *blandus* (Kunth) Kük. [basionym *Cyperus blandus* Kunth: 36 (1837)] for plants with spikelets up to 30 mm in length and about 50-flowered. Such enlarged spikelets are occasional. The phenomenon has been recorded for other genera and, at present, the reasons underlying it are speculative. Varietal status does not seem advantageous. Under the variety was cited *Kuntze 239* from Colenso (Midlands) (not traced).

25. **Cyperus natalensis** *Hochst.*, in Flora 28: 755 (1845); Steud.: 44 (1855); Boeck.: 343 (1869/70); C.B. Clarke: 570 (1894b); C.B. Clarke: 181 (1897/98); C.B. Clarke: 362 (1901/02); Kük.: 77 (1935). Figure 23I, L.

C. brevis Boeck.: 341 (1869/70). *C. congestus* Vahl var. *brevis* (Boeck.) Kük.: 445 (1936). *Mariscus congestus* (Vahl) C.B. Clarke var. *brevis* (Boeck.) C.B. Clarke: 554 (1894b); C.B. Clarke: 192 (1897/98); Gordon-Gray: 104 (1972). Syntypes: Cape, Prom. bon spei, *Ecklon & Zeyher 134; Zeyher 16* (B).

Vouchers: *F. Bayer s.n.; J. Browning 164; K.D. Gordon-Gray 6224; C.J. Ward 1281, 4884.*

Description: C.B. Clarke: 181 (1897/98).

Distribution: Coast, Maputaland.

Essentially a seashore species, very common along Natal coast in open areas where it may form extensive stands, stabilising sand and forming a fairly continuous and almost pure ground cover, the nodeless, trigonous culms standing about 1 m high. In most respects the species shows variability. Plants perennial, culms arising solitarily from ends of long stolons clothed in reddish brown sheaths, or more closely clustered. Generally leaves reduced to sheaths, but plants with a basal tuft of well-developed photsynthetic blades are not uncommon. Ward (1980), for Isipingo, records a low, leafy form flowering from culms 100–150 mm high and a taller, leafless form with culms to 1.4 m. These differences are repeated in *F. Bayer s.n.* from Umkomaas. The first form grows mainly in relatively loose wind-blown sand; the second in more stable situations in low-lying, open grassveld. Inflorescence form also varies from anthelas with long or short rays to more contracted, head-like examples. Boeckeler's species, *C. brevis*, marks plants with congested heads, but in field populations there is a wide range in inflorescence form, rayed and contracted heads sometimes being formed on culms interconnected by underground stolons. It is not advisable, because of gradations that exist, to attempt to recognise this variability even at infraspecific level.

Plants of *C. natalensis* have a coarse, hard texture, with 10–25 mm long, scarcely compressed spikelets. Stolons frequently tuberous at intervals, and sometimes culm base swollen; features that are frequently overlooked.

26. **Cyperus obtusiflorus** *Vahl*, Enumeratio plantarum 2: 308 (1805); Kunth: 45 (1837); Steud.: 27 (1855); Boeck.: 528 (1867/68); C.B. Clarke: 286 (1883a); C.B. Clarke: 110 (1884); Kük.: 285 (1936); P.L. Forbes: 45 (1987b); Hilliard: 53 (1987). Figure 24A, D.

C. sphaerocephalus Vahl var. *leucocephalus* Kunth: 45 (1837); Hochst.: 754 (1845). *C. niveus* Retz. var. *leucocephalus* (Kunth) Fosberg: 835 (1977) sensu R.W. Haines & Lye: 256 (1983).

C. compactus Lam.: 144 (1791); C.B. Clarke: 552 (1894b); C.B. Clarke: 168 (1897/98); C.B. Clarke: 319 (1901/02); K. Schum.: 118 (1895); Rendle: 112 (1899) non Retz.

C. striatulus Vahl: 311 (1805).

C. lacteus Steud.: 27 (1855). Type: Madagascar, *Boivin 2316*.

C. argenteus Ridl.: 133 (1884).

Icones: R.W. Haines & Lye: figs 517, 518 (1983) as *Cyperus niveus* var. *leucocephalus*.

Vouchers: *Edwards 1556; Killick 1806; Moll 1662, 4313; Pooley 1924; Shirley 214; C.J. Ward 165, 1647, 6445, 7575.*

Description: C.B. Clarke: 168 (1897/98) as *Cyperus compactus*.

Distribution: widespread, rare in Uplands.

One of the commonest and best known of Natal Cyperaceae. Components of grassland, particularly at Coast and through Midlands. Stout, usually uniseriate, rhizome clothed in dark leaf bases with bluish green leaves shorter than nodeless culms (up to 0.5 m high). Inflorescences solitary heads (rarely 1 head, either sessile or pedunculate, added) of about 40, compressed white spikelets. Variation in plant height and robustness is dependent upon season and extent of competition.

Widely distributed through Africa. The species was long known as *C. compactus* Lam., but Retzius (1788) had earlier applied that name to an Indian/Asian taxon. *C. obtusiflorus* Vahl was adopted for the African plants and numerous varieties were recognised within it (Kükenthal 1936). Those applicable to Natal were the typical phase and var. *flavissimus* (for var. *flavissimus* see *C. sphaerocephalus*, No. 40).

Fosberg (1977) made the decision that the African plants were merely varieties of the Asian *Cyperus niveus* Retz. and at this level he found the correct name for the typical *C. obtusiflorus* Vahl to be *C. niveus* var. *leucocephalus* (Kunth) Fosberg (see also Burtt 1986). This was accepted by Haines & Lye (1983), but Burtt expressed caution that is well founded, considering Clarke's (1901/02: 320) comment '... none of the material should be referred (as by Boeckeler and others) to the Indian *C. niveus* Retz., which has much thinner glumes and can be definitely distinguished, though nearly allied.' The Natal plants are here maintained under the name *C. obtusiflorus*.

This species is in need of detailed study in relation to its two close relatives *C. sphaerocephalus* (No. 40) and *C. margaritaceus* Vahl (No. 23).

27. **Cyperus papyrus** *L.*, Species plantarum, edn 1: 47 (1753); L.: 70 (1762); Kunth: 64 (1837); Steud.: 39 (1855); Boeck.: 303 (1869/70); Ridl.: 141 (1884); C.B. Clarke: 191 (1884); C.B. Clarke: 571 (1894b); C.B. Clarke: 374 (1901/02); Kük.: 45 (1935); R.W. Haines & Lye: 177 (1983).

C. papyraceus Crantz: 411 (1766).

Vouchers: *C.J. Ward 719, 1173*.

Many subspecies have been recognised including subsp. *madagascariensis* (Willd.) Kunth: 64 (1837); C.B. Clarke: 568 (1894b); C.B. Clarke: 184 (1897/98); Kük.: 48 (1935) (type from Madagascar), and subsp. *zairensis* (Chiov.) Kük.: 48 (1935); Podlech: 16 (1967); (type presumably from Zaïre). Clarke (1897/98) tentatively cited *Forbes s.n.*, Delagoa Bay as the first subsp. and Podlech cited *De Winter 4230* as the second.

Natal plants do not seem to have been given infraspecific status. They are referred to here at specific level only.

Distribution : Maputaland.

Largest Natal sedge. Extensive stands at mouth of M'folozi River. Natural southernmost limit on flood plain of M'hlatuze River in vicinity of University of Zululand (Empangeni area) and at Lake Cubhu near Richard's Bay (C.J. Ward pers. comm.).

Species easily recognised by height (upwards of 1.5–2.0 m) of smooth 3-angled culm, and size of many-rayed compound inflorescence, each ray invested basally by tubular prophyll. Leaves reduced to sheaths. Strong, thick rhizomes clothed in large brown scale leaves also characteristic. May provide a habitat for indigenous moth, *Eldana saccharina* Walker, that may attack sugar cane.

The species is known to undergo spontaneous natural hybridisation (see Hybrid Catalogue p. 206).

28. **Cyperus pectinatus** *Vahl*, Enumeratio plantarum 2: 298 (1805); Kunth: 107 (1837); R.W. Haines & Lye: 172 (1983). Type: West Africa, Guinea, *Isert s.n.* (C). Figure 24B, E.

C. nudicaulis Poir.: 240 (1806); Kunth: 48 (1837); Steud.: 58 (1855); C.B. Clarke: 296 (1883a); C.B. Clarke: 316 (1901/02); K. Schum.: 118 (1895); Kük.: 291 (1936); Podlech: 16 (1967). *Anosporum nudicaule* Boeck.: 411 (1869/70).

Atmostylis cyperiformis Steud.: 315 (1855). Type: Senegambia, *Leprieur s.n.*

A. flavescens Steud.: 315 (1855); Senegambia, *Leprieur s.n.*

Juncellus calanthus Peter: 48 (1928).

Icones: C.B. Clarke: t. 7, figs 1–3 (1909); Lye: fig. 2 (1971b) as *Cyperus nudicaulis*; R.W. Haines & Lye: fig. 328 (1983); Vanden Berghen: fig. 141 (1988).

Vouchers: *Musil 222* (PRE); *Pooley 1639; C.J. Ward 2605, 3268, 7303, 7476, 8049, 8974.*

Description: R.W. Haines & Lye: 172 (1983).

Distribution: Maputaland.

Plants tufted to straggling, irregular, sometimes stoloniferous, leafless perennials floating in permanent water of lakes, pans and swamps or rooted in alluvium along margins. Inflorescences are heads of 3–20 sessile, compressed, many-flowered (20–40), light-brown to dark reddish brown spikelets, sometimes with 1 to few rays added (each ray may carry only one spikelet). Glumes scabrid distally in the region of keel. Long acuminate apex and thickened, corky base of achene, make flotation possible besides adding to criteria by which the species may be identified.

29. **Cyperus prolifer** *Lam.*, Tableau encyclopédique et méthodique 1: 147 (1791); C.B. Clarke: 572 (1894b); C.B. Clarke: 339 (1901/02); Kük.: 256 (1936); Baijnath: 340 (1973); Getliffe & Baijnath: 277 (1976); R.W. Haines & Lye: 171 (1983). Type: 'Insula Franciae' (Mauritius), *Jos Martin 474* (P). Figure 24C, F.

C. papyroides Poir.: 270 (1806) ex herb. Lam.

C. aequalis Vahl: 320 (1805); Roem. & Schult.: 179 (1817); Spreng.: 220 (1825); Kunth: 37 (1837); Hochst.: 754 (1845); Steud.: 22 (1855); Boeck.: 557 (1867/68); C.B. Clarke: 287 (1883a); C.B. Clarke: 123 (1884). *Papyrus aequalis* Bojer: 381 (1837) ex herb. Lam.

C. isocladus Kunth: 37 (1837); Steud.: 22 (1855); C.B. Clarke: 565 (1894b); C.B. Clarke: 175 (1897/98); C.B. Clarke: 339 (1901/02). Type: Cape Province, 'Omsamwubo et Omsamcaba', *Drège 4431b* (P, iso.).

C. esculentus Drège & E. Mey.: 177 (1843) non L. s.s. *Drège 4431b*).

Icones: Getliffe & Baijnath: figs 1, 2 (1976); R.W. Haines & Lye: figs 326, 327 (1983).

Vouchers: *Baijnath 657, 710, 718* (all UDW); *Strey & Huntley 5023; C.J. Ward 469, 715, 2608, 6989, 8503.*

Description: Getliffe & Baijnath: 277 (1976).

Distribution: Coast, and immediate hinterland, Eshowe.

Plants rhizomatous perennials up to about 1 m high, leaves reduced to sheaths, inflorescence bracts short and inconspicuous amongst many rays each carrying usually

1–30 digitately arranged spikelets. Some of rays reflex to lie against culm, so that, at maturity, a well-developed inflorescence is spherical. Plants grow gregariously in streamlets and water holes where there is good aeration. Local stands, with little competition from other plants, resemble beds of diminutive *Cyperus papyrus*. Getliffe & Baijnath (1976) report that *C. prolifer* is intolerant of shading and of stagnant conditions. If drainage is long impeded, the inflorescences fail to form perfect spikelets and reproduction proceeds by vegetative proliferation from bract axils and ray tips. Chromosomes: 2n = 16.

30. **Cyperus pulcher** *Thunb.*, Prodromus: 18 (1794); Thunb.: 100 (1823); Nees: 133 (1835) excl. var. B.; Kunth: 144 (1837); Steud.: 58 (1855); Boeck.: 583 (1867/68); C.B. Clarke: 572 (1894b); C.B. Clarke: 171 (1897/98); Kük.: 234 (1936). Type: South Africa, without locality, *Thunberg*.

C. ingratus Kunth: 31 (1837). Type: *Drège* (?).

C. dregeanus Kunth: 31 (1837). Type: *Drège* (?).

Vouchers: *Guy & Ward 20; Musil 518* (PRE); *C.J. Ward 628*.

Description: C.B. Clarke: 171 (1897/98).

Distribution: Midlands, Zululand.

Plants medium-robust, tufted, leafy perennials up to 1 m with compact, not very well-developed, woody rhizome. Culms triangular, about 3 mm in diameter and winged below brown anthelate (sometimes contracted and head-like) inflorescence that is overtopped by leaf-like spreading bracts. Habitats are streamlets or river margins, plants rooted in shallows in wet mud or among rocks where there is a gentle permanent flow of water. The species is worthy of cultivation in water features of gardens.

Kükenthal (1936) placed *C. prasinus* Kunth within *C. pulcher* as var. *prasinus* (Kunth) Kük. *C. prasinus* has already been referred to under *C. albostriatus* (No. 1) and it is advisable that *C. pulcher* be included in any re-evaluation that is carried out on the complex comprising *C. albostriatus, C. leptocladus* and *C. mossii*. *C. pulcher* is not widespread in Natal, but where it occurs, plants are usually well represented.

31. **Cyperus pygmaeus** *Rottb.*, Descriptionum et iconum rariores et pro maxima parte novas plantas illustrantium liber primus: 20 (1773); Kunth: 18 (1837); Steud.: 13 (1855); Boeck.: 493 (1867/68); C.B. Clarke: 282 (1883a); C.B. Clarke: 28, 81 (1884); Kern: 634 (1974). Type: India, Tranquebar, *Koenig s.n.* (C).

Juncellus pygmaeus (Rottb.) C.B. Clarke: 596 (1893/94); C.B. Clarke: 546 (1894b); C.B. Clarke: 308 (1901/02). *Cyperus michelianus* (L.) Delile subsp. *pygmaeus* (Rottb.) Asch. & P. Graebn.: 273 (1904). *C. michelianus* (L.) Link subsp. *pygmaeus* (Rottb.) Asch. & P. Graebn. sensu Kük.: 312 (1936); R.W. Haines & Lye: 262 (1983).

Icones: Rottb.: t. 14, figs 4, 5 (1773); Kük.: fig. 35 F, G (1936); R.W. Haines & Lye: figs 532, 533 (1983); Vanden Berghen: fig. 140 (1988) as *C. michelianus* (L.) Link subsp. *pygmaeus* (Rottb.) C.B. Clarke.

Vouchers: *Furness 172, 448*.

Note: there have been differences of opinion in the treatment of *Cyperus pygmaeus* Rottb. (glumes distichous) and *Scirpus michelianus* L. (glumes spiral). Some authorities have considered them conspecific; others have maintained them in different genera (Kern 1974; Haines & Lye 1983).

Description: C.B. Clarke: 308 (1901/02) as *Juncellus pygmaeus*.

Distribution: Maputaland (Pongolo River system).

Plants short, densely tufted, leaf-bearing annuals, blades sometimes longer than trigonous culms. Inflorescences small heads of compactly arranged, small, sessile, compressed spikelets with glumes 2-ranked. Subtending bracts long, dilated basally. Heads obviously compound because between groups of spikelets are shorter bracts. Style branches two. Like other species at one time segregated by Clarke (1893/94) into the genus *Juncellus*, achenes have one flat (adaxial) and one rounded (abaxial) surface.

In Maputaland, as a small, short-lived herb of temporarily flooded areas, the species has probably often been overlooked.

32. **Cyperus rigidifolius** *Steud.* in Flora 25: 593 (1842); A. Rich.: 486 (1851); Steud.: 30 (1855); Boeck.: 528 (1867/68); K. Schum.: 118 (1895); C.B. Clarke: 573 (1894b); C.B. Clarke: 367 (1901/02); Kük.: 3 (1921); Kük.: 104 (1935); R.W. Haines & Lye: 185 (1983); P.L. Forbes: 45 (1987b).

C. adoensis Hochst. mss. name only ex A. Rich.: 484 (1851); Steud.: 23 (1855). *C. longus* L. var. *adoensis* Boeck.: 281 (1869/70).

C. atrosanguineus Hochst. ex Steud.: 30 (1855); Boeck.: 527 (1867/68).

Icones: R.W. Haines & Lye: figs 359, 360 (1983).

Voucher: *C.J. Ward 8477*.

Description: R.W. Haines & Lye: 185 (1983).

Distribution: Coast.

Plants stoloniferous, leaf-bearing perennials most readily identified by glume coloration (flanks dark brownish black, midribs green or yellow when dry), giving an almost striped appearance, obvious in life, not so striking when dry. Other significant features: linear, many-flowered rather rigid, 12–27 × 1.0–2.0 mm spikelets, often aggregated into a close-packed, bracteated head, but occasionally with several well-developed rays added; stout rhizome that becomes irregularly tuberous, sometimes thickened to 8 mm in diameter, sometimes clothed in black fibres.

In Natal, plants seem to behave as weeds growing in lawns or in disturbed grassland. Because of this habitat behaviour there is often confusion with *Cyperus rotundus* (No. 33). There is also close relationship with *C. longus* (No. 22), which however, has brown glumes and stolons that often do not swell irregularly into tubers. *C. rigidifolius* is not adequately known in the area and should be studied. See also *C. longus* (No. 22).

33. **Cyperus rotundus** *L.*, Species plantarum, edn 1: 45 (1753); L.: 67 (1762); Kunth: 58 (1837) p.p. excl.

syn. *C. bulbosus* Vahl; Steud.: 32 (1855); Boeck.: 283 (1869/70); C.B. Clarke: 614 (1893/94); C.B. Clarke: 574 (1894b); C.B. Clarke: 182 (1897/98); C.B. Clarke: 364 (1901/02); Kük.: 107 (1935); Podlech: 17 (1967); P.L. Forbes: 45 (1987b).

C. rotundus (purple nut sedge; nut-grass) is generally acknowledged to be the 'world's worst weed' (Tucker 1987). Plants have a cosmopolitan distribution in tropical and subtropical regions of the world; present also, but less frequent in temperate climates. They are very variable and numerous synonyms and infraspecific categories exist. Only those relevant to Natal are dealt with here. Tucker (1987) recorded that known chromosome numbers indicate polyploid races within the species. Like *C. esculentus* (No. 15), *C. rotundus* develops slender stolons (darker and more wiry than those of *C. esculentus*) that terminate in small tubers. It is by these organs that rapid spread takes place. Koyama (1985) reported that *C. rotundus* is a traditional medicinal plant: 'die Apothekegräser' in Germany; well used as a natural drug in India, China, Japan and Sri Lanka. Kern (1974) commented that the leaves provide a rather good pasturage.

In Natal two subspecies that are morphologically different and therefore usually readily distinguished one from the other, are common.

subsp. **rotundus**. J. Kern: 604 (1974); R.W. Haines & Lye: 186 (1983). Type: from India. Figure 24H, K.

Icones: Kük.: fig. 13 (1935); Kern: fig. 49 (1974); T. Koyama: fig. 10g, h (1985); Vanden Berghen: fig. 150 (1988).

Vouchers: *Pooley 1502A; C.J. Ward 749, 5350.*

Description: Kern: 604 (1974); R.W. Haines & Lye: 186 (1983).

Distribution: widespread.

Both Kükenthal's and Kern's illustrations (see Icones above) represent accurately the general appearance of Natal plants, except that the inflorescences may be more contracted into heads or pseudo-heads; the heads occasionally reduced to few or one spikelet(s). This typical phase is widespread in Natal as a weed of cultivation, but plants are probably not as numerous as are those of *C. esculentus* (particularly in the Uplands). However, they may be more persistent and enduring; for example, the shoots are capable of penetrating cracks in tarred surfaces, and then withstanding the intense reflected heat of midday. Spikelets are variable in length, sometimes exaggeratedly long, but these are not known to set viable achenes.

subsp. **tuberosus** *(Rottb.) Kük.*: 113 (1935); R.W. Haines & Lye: 188 (1983). Type: (?) Iconotype, Rottb.: t. 7, fig. 1 (1773). Figure 24I, L.

Cyperus tuberosus Rottb.: 18 (1772); Rottb.: 28 (1773). *C. rotundus* L. var. *tuberosus* (Rottb.) Kük.: 305 (1925).

Icones: R.W. Haines & Lye: fig. 365 (1983).

Vouchers: *T.H. Arnold 100; Lawson 377; C.J. Ward 742, 6240, 7658.*

Description: R.W. Haines & Lye: 188 (1983).

Distribution: Coast (generally not south of Durban), Maputaland.

In Natal, plants of subsp. *tuberosus* are more robust and coarser than those of the typical subspecies. There appear to be two colour forms: in the more usual form the spikelets are fawn to light brown and dull, not reflecting light as do the dark red to purple-red spikelets of subsp. *rotundus*: in the second colour form the spikelets are green, tinged chestnut-red (far more beautiful than the dull brown version).

The identity of specimens from Natal (*Buchanan 311, 312; Drège 4420; Gerrard 705; Kuntze 297*) sometimes cited under *C. rotundus* var. *platystachys* C.B. Clarke and sometimes placed with *C. natalensis* Hochst. (Clarke 1894b, 1897/98, 1901/02) needs re-evaluation. It is not clear whether var. *platystachys* is synonymous with subsp. *tuberosus*.

In order to attempt to elucidate the differences that exist between *C. esculentus* and the two subspecies of *C. rotundus*, the following summary is given:

C. esculentus: leaves and culms yellow-green; inflorescences golden; glumes 2.2–2.6 mm long, midrib terminating below or in obtuse membranous apex (very occasionally minutely excurrent), flanks 3–4-veined, veins regularly distanced one from the other, fading before membranous margin.

C. rotundus subsp. *rotundus*: leaves and culms bluish green; infloresences dark red-brown or purplish, rather shining; glumes 3.3–4.0 mm long, midrib as for *C. esculentus*, flanks 2–3-veined (not always consistent), regularly distanced one from the other, fading some distance before membranous margin.

C. rotundus subsp. *tuberosus*: leaves and culms mid-green. Inflorescences dull brown or bright green tinged chestnut-red. Plants more robust than *C. esculentus* and *C. rotundus* subsp. *rotundus* , usually exhibiting strong growth. Spikelets coarser and longer than those of the last-mentioned two, (up to 55 mm long). Glumes 3.7–4.3 mm long, apex acute with midnerve slightly excurrent (occasionally terminating in apex), flanks with 2–4 close-placed veins, fading before membranous margin.

34. **Cyperus rubicundus** *Vahl*, Enumeratio plantarum 2: 308 (1805); Kunth: 49 (1837); Steud.: 29 (1855); Boeck.: 507 (1867/68); C.B. Clarke: 104 (1884); R.W. Haines & Lye: 258 (1983). Type: Puerto Rico, *Ventenat* (C).

C. teneriffae Poir.: 245 (1806); Nees: 131 (1835); C.B. Clarke: 579 (1894b); C.B. Clarke: 166 (1897/98); C.B. Clarke: 317 (1901/02); K. Schum.: 118 (1895); Kük.: 306 (1936); Podlech: 18 (1967).

C. serra A. Rich.: 479 (1851). Type: from Ethiopia?

Icones: Kük.: fig. 34 H–K (1936); R.W. Haines & Lye: figs 520, 521 (1983).

Vouchers: *Feely 93; C.J. Ward 677, 1756.*

Description: C.B. Clarke: 166 (1897/98) as *C. teneriffae*; R.W. Haines & Lye: 258 (1983).

Distribution: Coast, Midlands (not high altitudes), Zululand.

Distributed through Africa, also present in Madagascar, Arabia, India and Teneriffe. In Natal, plants tufted, leaf-bearing, soft-textured, annuals (?) growing in temporarily damp, moss-covered shallow soil overlying rock outcrops, usually in full sunlight. Most easily recognised by the tendency for basal shoots to become slightly swollen (invested by loose sheaths that do not become fibrous); heads of few to many, rather squarrose, compressed, greenish reddish brown spikelets; glume with midrib becoming prominent distally then excurrent into short, recurved apiculum.

There is relationship in spikelet coloration with *C. compressus* (No. 5), but the plant bases differ. There is also relationship with several other Natal species [*C. rupestris* (No. 35), *C. semitrifidus* (No. 37), *C. thorncroftii* (No. 45)], and careful study of all in the field is needed. Nevertheless, *C. rubicundus* is distinctive in its texture (sometimes almost succulent), and in its spikelets. Style branching requires special observation as there are reports of imperfect development of the style branches (see No. 37, *C. semitrifidus*).

35. **Cyperus rupestris** *Kunth*, Enumeratio plantarum 2: 52 (1837); Steud.: 30 (1855); Boeck.: 510 (1867/68); C.B. Clarke: 575 (1894b); C.B. Clarke: 167 (1897/98); C.B. Clarke: 317 (1901/02); Kük.: 304 (1936); P.L. Forbes: 45 (1987b); Hilliard: 53 (1987); Hilliard & B.L. Burtt: 113 (1987). Type: Cap. b. spei, locis rupestribus humidis, *Drège*.

C. cognatus Kunth: 52 (1837); Boeck.: 511 (1867/68). Type: *Drège* (?).

Note: in Natal, this species is well represented, both in number of plants and in area of distribution. It is, however, much in need of detailed study. As it is presently known, it is variable, three varieties being recognised.

These varieties follow Kükenthal's (1936) interpretation. Study may indicate the need for re-establishment of var. *amnicola* (Kunth) Kük. and var. *parvinux* (C.B. Clarke) Kük. as independent species.

var. **rupestris**

Vouchers: *Hilliard & B.L. Burtt 15303; B.J. Huntley 648; K.D. Huntley 430; Moll 1193, 1360, 2220* (PRE).

Description: C.B. Clarke: 167 (1897/98).

Distribution: widespread (confirmation required).

Plants of var. *rupestris* (Figures 25; 26A, D) densely tufted, leaf-bearing perennials seldom taller than 150 mm. Shoot bases densely invested with persistent sheaths that eventually become fibrous. Erect, almost wiry leaf blades may equal culms, but are usually shorter, 1.0–1.7 mm wide, linear, tapering slightly distally. Solitary heads (no rays ever known) comprise usually 5–9 dark brown, shining, compressed, sessile, coarsely serrate-margined spikelets. Glume flanks each 4–5-veined, apex notched with midvein excurrent into mucro. Stamens 3; style short with 3 long branches. Plants grow in shallow soil over rock outcrops, or in stony ground.

Even within the variety, plants are not uniform. From Ngoye into Maputaland they exhibit increasing resemblance to *C. thorncroftii* (No. 45) (but there are typical specimens of var. *rupestris* from Mozambique). In the Uplands they grade into *C. semitrifidus* (No. 37).

var. **amnicola** *(Kunth) Kük.*, in Das Pflanzenreich, 101: 304 (1936). Type: *Drège* (?). Figure 26B, E.

Cyperus amnicola Kunth: 52 (1837); Steud.: 30 (1855); Boeck.: 509 (1867/68); Ridl.: 131 (1884); C.B. Clarke: 548 (1894b); C.B. Clarke: 167 (1897/98); C.B. Clarke: 318 (1901/02).

Vouchers: *Balkwill & Manning 411; J. Browning 329, 372; K.D. Gordon-Gray 735.*

Description: C.B. Clarke: 167 (1897/98).

Distribution: Coast (southernmost region in particular).

In Natal, plants of var. *amnicola* grow in shallow sand over sandstone rocks where temporary moisture is often available, sometimes in the form of condensate from damp air. The distributional range needs confirmation. Differences from the typical variety are in the stiff, wide, succulent, obtuse leaf blades with glabrous sheaths that persist and darken forming a sheath to the shoot, seldom breaking into fibres, and in the more closely imbricated glumes giving a finely serrate margin to the spikelets.

var. *amnicola* is far more uniform than var. *rupestris*.

var. **parvinux** *(C.B. Clarke) Kük.*, in Das Pflanzenreich, 101: 304 (1936). Syntypes: Cape Province, Albert Div., near Molteno, *Kuntze 264* (K); Transvaal, Houtbosch, *Rehmann 5648* (K); Bosch Veld at Elands River, *Rehmann 4998* (K). Figure 26C, F.

Cyperus parvinux C.B. Clarke: 167 (1897/98).

Voucher: *Hilliard & B.L. Burtt 15423.*

Description : C.B. Clarke: 167 (1897/98).

Distribution: Uplands.

The essential differences by which var. *parvinux* is segregated are smaller glumes and achenes and the long overtopping main bract of inflorescence (there may be a long overtopping bract in var. *rupestris*, but in relation to plant size, it is not so striking). Var. *parvinux* needs reappraisal in Natal, too little being known at present to estimate its variability.

Key to varieties

1a Glumes 1.7–2.0 mm long. Achenes 0.5–0.7 × 0.4–0.5 mm . . var. *parvinux*
1b Glumes 2.8–3.5 mm long. Achenes 0.7–1.2 × 0.6–0.8 mm 2

2a Leaf blades stiff, succulent, with obtuse, slightly scabrid apices: sheaths persisting to form a thick investment of shoot; not becoming fibrous. Glumes shining chestnut-brown closely imbricated giving spikelet margin a finely serrated outline . . . . var. *amnicola*
2b Leaf blades wiry, linear, with narrowly obtuse, usually glabrous apices: sheaths forming a thick investment of shoot, becoming fibrous. Glumes shining dark brown, fairly loosely imbricated giving spikelet a coarsely serrate margin . . . . var. *rupestris*

36. **Cyperus schlechteri** *C.B. Clarke* in Bulletin Herbarium Boissier, Sér. 3: 663 (1903); C.B. Clarke: 3 (1908); Hilliard: 53 (1987); Hilliard & B.L. Burtt: 113 (1987) non Gandoger. Type: Natal, alt. 2 000 m, in monte Insisiwa [near Kokstad], *Schlechter 6447*.

Vouchers: *T.H. Arnold 849, 854; Bayer & McClean 187; Edwards 2280; Hilliard & B.L.Burtt 8407, 15149, 15296, 17422, 17494; Schelpe 1406.*

Description: C.B. Clarke: 3 (1908).

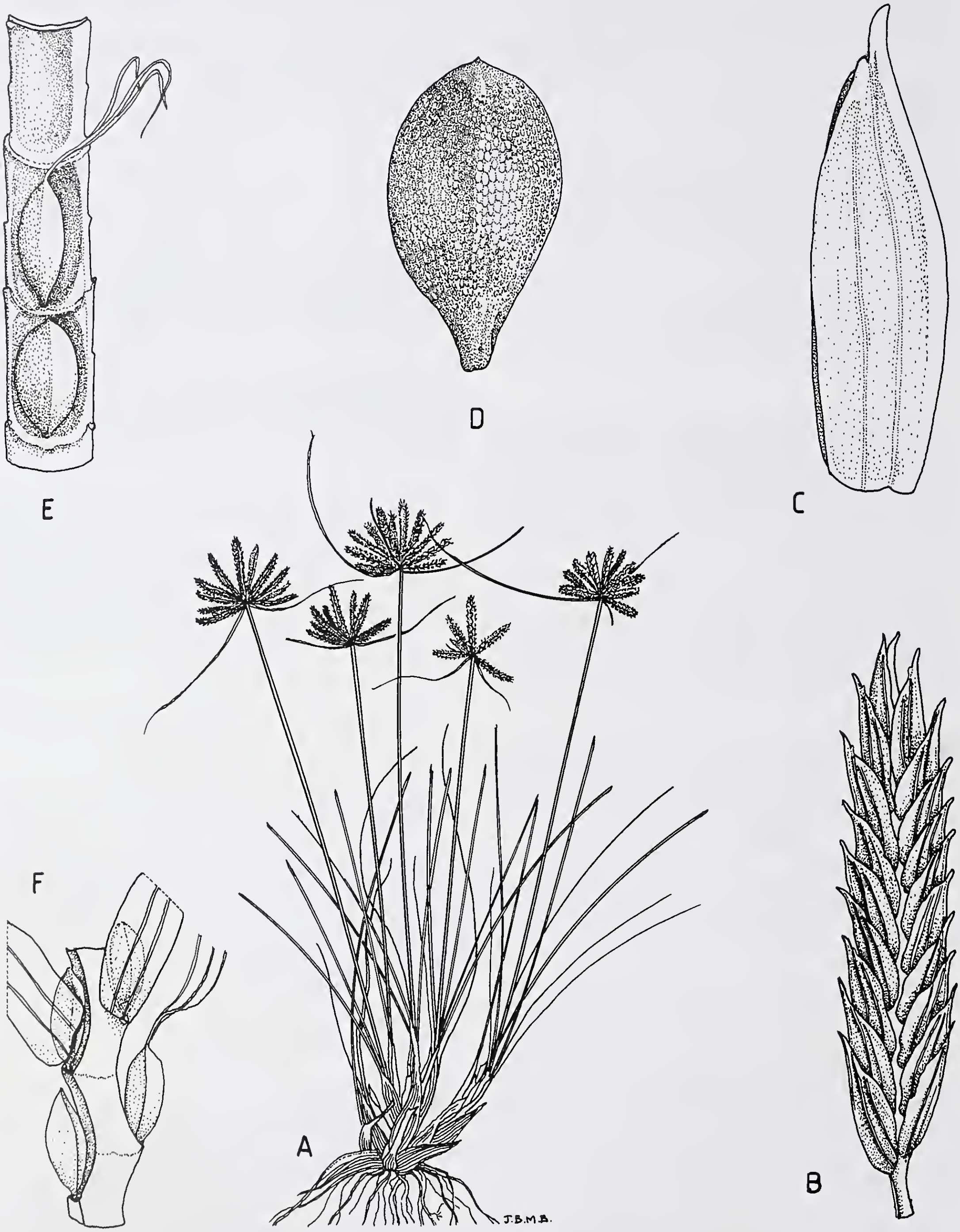

FIGURE 25.—*Cyperus rupestris* var. *rupestris, B.J. Huntley 648.* A, young plant, without marked development of fibrous leaf sheaths, × 1; B, spikelet, × 10; C, glume, lateral view, × 35; D, achene, × 60; E, rachilla, with glumes removed, × 24; F, rachilla, with 2 glumes removed, showing 4-angled structure with achenes recessed into cavities of rachilla, × 21.

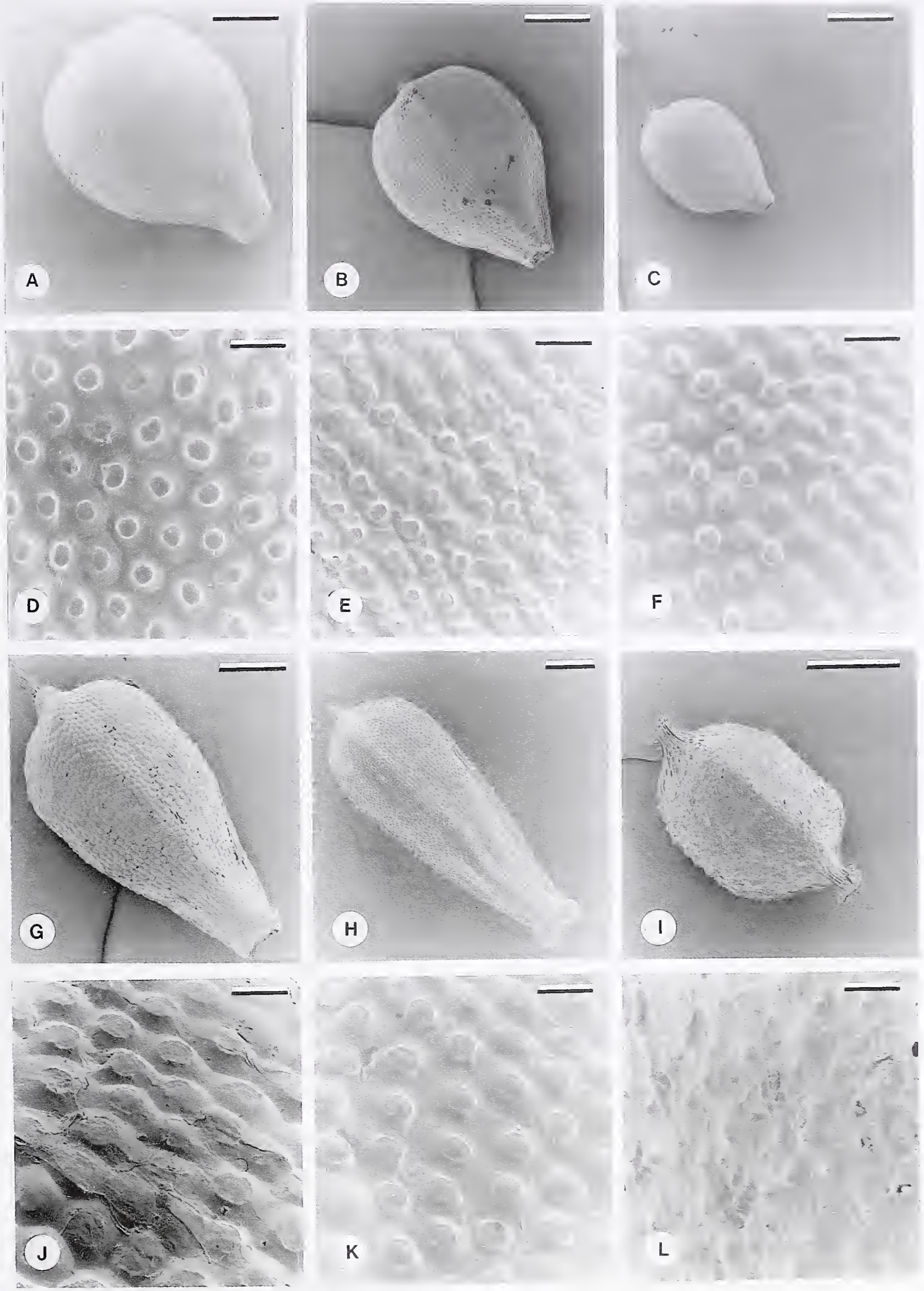

FIGURE 26.—*Cyperus*. A, D, *C. rupestris* var. *rupestris*, *Morris 457*; B, E, *C. rupestris* var. *amnicola*, *Balkwill & Manning 411*; C, F, *C. rupestris* var. *parvinux*, *Hilliard & B.L. Burtt 15423*; G, J, *C. semitrifidus* var. *semitrifidus*, *Everson 346*; H, K, *C. semitrifidus* var. *multiglumis*, *Hilliard & B.L. Burtt 19016*; I, L, *C. sexangularis*, *Ward 4409*. Scale bars: A–C, G–I, 250 µm; D–F, J–L, 25 µm.

Distribution: Uplands, Midlands (highest parts only), N Natal.

Slender perennials up to about 250 mm high, growing in shallow soil over rock sheets, or in stony ground, often sandstone, up to altitudes of ± 2 550 m. Dainty appearance of plants, accentuated by thin culms and small spiky heads of closely packed spikelets, is characteristic. Glumes green, keeled in life, apiculate. The characteristic daintiness is, however, not always evident, the typical aspect grading into plants that are 'heavier' in appearance, suggesting hybridisation and introgression having taken place between *C. schlechteri* and *C. semitrifidus* (No. 37).

37. **Cyperus semitrifidus** *Schrad.*, Analecta ad floram capensem 1: 6 (1832b); Kunth: 107 (1837); Steud.: 58 (1855); Boeck.: 513 (1867/68); C.B. Clarke: 576 (1894b); C.B. Clarke: 170 (1897/98); Schönland: 26 (1922); Kük.: 300 (1936); P.L. Forbes: 46 (1987b); Hilliard: 53 (1987); Hilliard & B.L. Burtt: 113 (1987).

C. crinitus Spreng.: 5 (1829) non Poir. (not *C. cruentus* Rottb.; non Retz.; non Boeck. which was confused because of citation of the type in error).

C. usitatus Nees: 516 (1832) non Burch. ex C.B. Clarke.

C. herbivagus Kunth: 53 (1837). Type: *Drège* (?).

C. lapidicolus Kük.: 300 (1936). Type: South Africa, Cape Province, Bluekranz River, 1 100 m, *Schlechter 6876*.

Icones: Schönland: t. 12 (1922); Kük.: fig. 34A–D (1936).

Description: C.B. Clarke: 170 (1897/98); Kük.: 300 (1936).

Note: in Natal, this species is extremely variable. Kükenthal (1936) recognised four varieties. Of these only the typical phase was reported for Natal. The species is greatly in need of detailed study. Varieties are recognised in this work, but their limits are not convincing and their systematic value needs re-appraisal.

var. **semitrifidus**. Figure 26G, J.

Vouchers: *Everson 324, 346* (CPF); *Hilliard & B.L. Burtt 15189, 17124; Shirley s.n.; Tinley 1019.*

Distribution: Midlands, Uplands, N Natal, Zululand, Maputaland.

Erect, rather slenderly tufted, sparsely leafy perennial plants, ± 250(–300) mm high, grow in shallow soil overlying rock outcrops, sometimes in moss mats where temporary water is available, more often in drier gravelly ground and in stony, bare, inhospitable situations.

Variation occurs in the degree of investment of shoot bases by persistent sheaths; in leaf blade width; in inflorescence branching (from a rayed anthela to a spherical, or less commonly, a hemispherical head); in spikelet colour (reddish pink through fawn to deep red or brown to dark purplish black).

Unifying characters are: (i) 2-ranked, closely imbricated glumes, flanks strongly veined, apices mucronate (mucro short, straight to slightly recurved, a direct continuation of midrib, glume tissue closely adhering, not forming a notch). Closely packed glumes give a characteristic finely serrated margin to the markedly compressed spikelets; (ii) elongate style, unbranched or with 1–3 short, poorly developed arms; (iii) leaf blades frequently, but not always, curved outwards. Width varies from 1.0–4.0 mm (wider examples are widest about the middle, narrowing to base and apex).

In the Uplands, limits for var. *semitrifidus* are blurred as there is evidence of gradation into *C. rupestris* var. *rupestris*.

var. **multiglumis** *(Turrill) Kük.*: 301 (1936). Type: Transvaal, Sandfontein, 1 300 m, *Schlechter 4251*. Figure 26H, K.

Cyperus multiglumis Turrill: 67 (1925).

Voucher: *Hilliard & B.L. Burtt 19016*.

Differs from typical phase in its long spikelets with more glumes (40–50). Achenes also reported as smaller (⅓ glume length: ⅔ glume length in var. *semitrifidus*). Spikelets of exaggerated length have been reported in other species of Cyperaceae (*Cyperus rotundus* L., Kern 1974; *Scirpus dioecus* (Kunth) Boeck., Browning 1989). Their significance is not fully understood, but seems related to a genetic and/or reproductive context, doubtfully possessing taxonomical significance.

Note: an unusual gathering, *Hilliard & B.L. Burtt 14142*, from Uplands, Cobham Forest Reserve, is tentatively placed under var. *multiglumis*. Further study of plants in the locality is needed. *Cyperus remotiflorus* Kük. (Figure 24G, J) at present unknown in Natal, should be compared.

38. **Cyperus sensilis** *Baijnath* in Journal of South African Botany 42: 369 (1976). Type: South Africa, Natal, Wentworth near Durban, Happy Valley Bird Sanctuary, *Baijnath 793* (UDW, holo.).

Vouchers: *Baijnath 793, 801, 823, 831; C.J. Ward 2781, 6804.*

Description: Baijnath: 371 (1976).

Distribution: Coast.

Rhizomatous perennials up to 1 m high. Leaves reduced to sheaths. Resemblance with *C. prolifer* (No. 29) in general growth form, but inflorescences more compact with far fewer rays (25–57; 100–250 in *C. prolifer*), these all forming acute angle with culm apex, so that in outline a mature inflorescence is less than hemispherical. Stamens 3 per floret, but achenes do not fully develop, suggesting some genetic imbalance, but vegetative proliferation from inflorescence has not been observed.

The species is not known at altitudes exceeding 300 m. Favoured habitats are loamy substrates with a high organic content and plentiful water (usually the margins of swamps and streamlets).

39. **Cyperus sexangularis** *Nees* in Linnaea 9: 284 (1834b) name; Nees: 135 (1835); Kunth: 32 (1837); Hochst.: 754 (1845); Steud.: 19 (1855); Boeck.: 568 (1867/68); C.B. Clarke: 577 (1894b); C.B. Clarke: 175 (1897/98);

C.B. Clarke: 338 (1901/02); Kük.: 191 (1936). Type: Cape, Circa Castellum 'Beaufort' (Fort Beaufort), *Drège* (?). Figure 26I, L.

C. webbianus Steud.: 20 (1855).

Icones: Kük.: fig. 22A–E (1936).

Vouchers: *Edwards 914; Killick 622; C.J. Ward 1628, 4409.*

Description: C.B. Clarke: 175 (1897/98).

Distribution: Coast, Midlands, N Natal, Zululand (?), Maputaland.

C. sexangularis is one of the group of species [see also *C. alternifolius* (No. 3), *C. textilis* (No. 44)] recognizable by the absence of leaf blades, but with involucre of green, photosynthetic bracts surrounding anthelate inflorescence. As the name implies, culms, at least below inflorescence, but usually throughout their length, are 6-angled and scabrid. Plants similar in general facies to *C. alternifolius* subsp. *flabelliformis*, but more slender. Distribution of the species in Natal is also different; plants extending through Midlands and N Natal grow along margins of rivers and streamlets or localised wet areas, often in water.

Under cultivation, *C. sexangularis* is a popular feature of water gardens, but plants will survive under drier conditions, provided there is no long-maintained water stress.

40. **Cyperus sphaerocephalus** *Vahl*, Enumeratio plantarum 2: 310 (1805); Kunth: 45 (1837); Oliv.: 164 (1875); B.L. Burtt: 356 (1986); Hilliard: 53 (1987); Hilliard & B.L. Burtt: 113 (1987). Type: South Africa, Cape of Good Hope, coll. *Brugm[ans]* (C, herb. Vahl, I.D.C. microfiche 23). Figure 27A, C.

C. sphaerocephalus Vahl var. *sphaerocephalus*; Kunth: 45 (1837), by establishment of var. *leucocephalus* Kunth. *C. obtusiflorus* Vahl var. *sphaerocephalus* (Vahl) Kük.: 67 (1934).

C. flavissimus Schrad.: 1067 (1821); Schrad.: 5 (1832b); *C. obtusiflorus* Vahl var. *flavissimus* (Schrad.) Boeck.: 529 (1867/68); Kük.: 286 (1936); P.L. Forbes: 45 (1987b). *C. compactus* Lam. (non Retz.) var. *flavissimus* (Schrad.) C.B. Clarke: 552 (1894b); Schönland: 25 (1922). *C. niveus* Retz. var. *flavissimus* (Schrad.) Lye in R.W. Haines & Lye: 257 (1983). Type: South Africa, Cape of Good Hope, *Hesse s.n.*

Icones: Schrad.: t. 2; fig. 2 (1832b); Schönland: t. 11 (1922); Vorster: t. 1666 (1973); Davis in Hilliard: 53 (1987).

Vouchers: *Comins 597; Edwards 438, 1104; K.D. Gordon-Gray 5037; Hilliard & B.L. Burtt 18612; Killick 961.*

Description: Vorster: text accompanying t. 1666 (1973) as *Cyperus obtusiflorus* var. *flavissimus*.

Distribution: Midlands, Uplands, Zululand (area adjoining Midlands only), N Natal, S Natal (Weza, Kokstad).

Burtt (1986) expressed lack of conviction in accepting the long maintained varietal relationship between the perennial white- and yellow-flowered grassland sedges so well known in Natal under the name *Cyperus obtusiflorus* Vahl and before that, incorrectly, under the preoccupied combination *C. compactus* Lam. non Retz. (see No. 26). This author advocated ranking as independent species because of differing distributional patterns (other criteria not fully explored). This has been followed in the present work, pending further study.

In Natal, bright yellow-headed entity known from Midlands and Uplands grassveld between altitudes of 670–2 100 m, also well represented in southern Natal. White-headed form widespread, but predominantly at Coast and through Midlands, into Zululand and N Natal; rare in Uplands. Zones of sympatry occur particularly where Midlands abut on Zululand (Greytown, Ahrens, Kranskop, Babanango area), and it is of special interest that it is within this common area that plants bearing pale yellow heads are known. There is overlap also near Pietermaritzburg and in southern Natal, where pale-headed plants should be looked for. Further investigation is essential and should cover the range of both entities in the whole of Africa. Also included should be the similar, but somewhat more tropical, *Cyperus margaritaceus* (No. 23). With acceptance of the yellow-flowered entity as a species, its name must become *C. sphaerocephalus* Vahl (see Burtt 1986).

In Natal, plants generally shorter, more compact and more robust than those of the white-headed *C. obtusiflorus* (No. 26). Burtt has suggested there may also be floral differences, but these must be further substantiated before acceptance. In *C. sphaerocephalus* the beautiful golden glumes become dull muddy brown with age; a colour not so readily developed by the glumes of *C. obtusiflorus* which turn a lighter fawn or remain off-white. The relationship between *C. obtusiflorus* and *C. sphaerocephalus* is, to some extent, paralleled in *Kyllinga* by the species *K. alba* and *K. alata*.

41. **Cyperus sphaerospermus** *Schrad.*, Analecta ad floram capensem. 1. Cyperaceae: 8 (1832b); Kunth: 106 (1837); Hochst.: 754 (1845); C.B. Clarke: 577 (1894b); C.B. Clarke: 172 (1897/98); C.B. Clarke: 336 (1901/02); Levyns: 99 (1950). Type: Cape, Zeekoe Vallei, *Ecklon 82* (?). Figure 27B, D.

C. denudatus L. f. var. *sphaerospermus* (Schrad.) Kük.: 255 (1936).

C. corymbosus Steud.: 153 (1829) non Rottb.

C. flavissimus Steud.: 152 (1829) non Schrad.

C. denudatus L. f. var. *tenuiculmis* Boeck.: 577 (1867/68); C.B. Clarke: 124 (1884).

C. huillensis Ridl.: 139 (1884) including var. *aphylla*. Syntypes: Angola, *Welwitsch 6867, 6868, 6869, 6889.*

C. arrhizus Boeck. ex C.B. Clarke: 577 (1894b) name only.

Vouchers: *Edwards 2564; Moll 1084, 4638; Pooley 1680; Strey & Huntley 5021; C.J. Ward 498, 600, 2106, 4162, 8087; M.C. Ward 816.*

Description: C.B. Clarke: 173 (1897/98).

Distribution: Coast, Midlands, Zululand, Maputaland.

Often occurs in profuse, almost pure stands in moist alluvium along margins of swamps and streamlets or on damp, grassy banks overhanging water. Rhizomatous leaf-bearing perennials with anthelate inflorescences that eventually lodge, root, and produce further culms from vegetative buds on inflorescences.

Relationship is with *C. denudatus* L. f. (No. 9), *C. halpan* L. and probably *C. deciduus* Boeck. (the two latter not yet recorded for Natal, although present in Swaziland and Mozambique). Collectively the four species form a group worthy of detailed study, especially from aspects

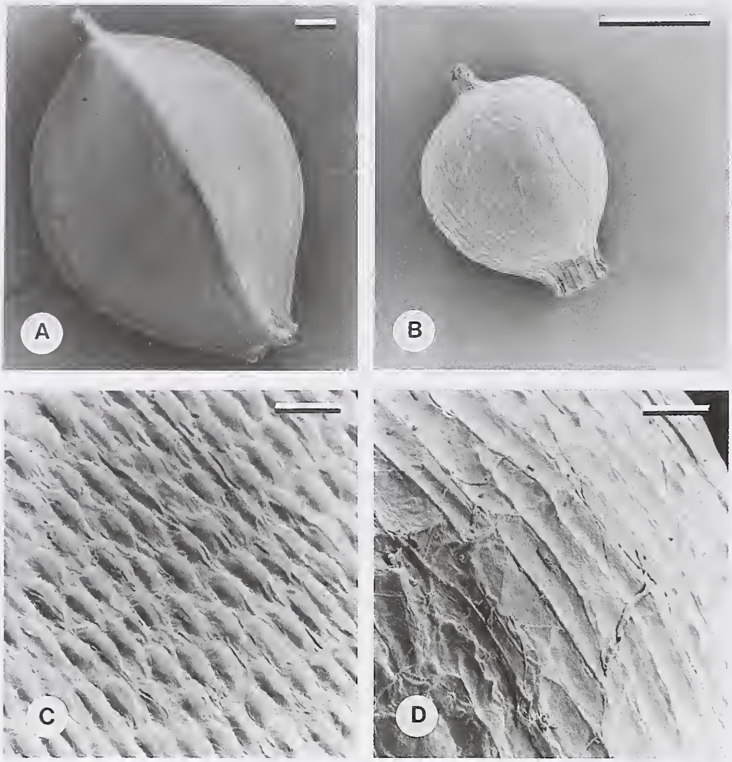

FIGURE 27.—*Cyperus*. A, C, *C. sphaerocephalus, Hilliard & B.L. Burtt 18612*; B, D, *C. sphaerospermus, Wilker s.n.*. Scale bars: A, B, 250 µm; C, D, 25 µm.

of reproductive method(s) and karyology. *C. sphaerospermus* should be investigated with regard to possible spontaneous hybrid origin from two (?) of the other species listed.

As has been mentioned under *C. denudatus* (No. 9.), *C. sphaerospermus* was long regarded as the leaf-bearing phase of that species, but the differences listed below are sufficient to require specific ranking for both entities.

C. denudatus

Rhizome generally uniseriate. Leaves reduced to sheaths, with, or lacking, blade-like outgrowths up to 10 mm long. Culms 3-angled, winged especially under inflorescence, soft, 0.5–5.0 mm in diameter. Spikelets shining, dark chestnut-brown 0.8–1.5 mm wide (not always perfectly formed, but never proliferating from inflorescence). Bracts short.

C. sphaerospermus

Rhizome compacted, rarely uniseriate. Leaves with blades 3–4 mm wide, shorter than or equalling culm length. Culms 3-angled under inflorescence, not winged, firm, 0.5–2.0 mm in diameter. Spikelets usually dull green or pale brown, suffused red, 3–4 mm wide. Bracts well developed, at least 2 are longer than inflorescence branches. *C. sphaerospermus* does not always perfect achenes. When developed they are small, resembling those of *C. denudatus*.

42. **Cyperus tenax** *Boeck.* in Linnaea 35: 504 (1867/68); K. Schum.: 118 (1895); C.B. Clarke: 578 (1894b); C.B. Clarke: 170 (1897/98); C.B. Clarke: 334 (1901/02); Kük.: 259 (1936); Podlech: 17 (1967); R.W. Haines & Lye: 267 (1983); P.L. Forbes: 46 (1987b). Type: South Africa, Natal, *Gueinzius 13*.

C. monroviensis Boeck.: 90 (1884). Type: from Monrovia.

C. sabulicolus Ridl.: 136 (1884). Syntypes: Angola, *Welwitsch 6794, 6866, 7038, 7049* .

C. actinostachys Welw. ex Ridl.: 140 (1884). Syntypes: from Angola, *Welwitsch 6874, 6928, 6931*.

C. andongensis Ridl.: 140 (1884); Rendle: 111 (1899). Type: from Angola, *Welwitsch 6929*.

C. boehmii Boeck.: 498 (1884); K. Schum.: 118 (1895); C.B. Clarke: 550 (1894b); C.B. Clarke: 335 (1901/02). *C. amabilis* Vahl var. *pseudocastaneus* Kük.: 2 (1921). Type: from tropical Africa.

Icones: R.W. Haines & Lye: figs 546, 547 (1983).

Vouchers: *Hilliard & B.L. Burtt 15466; K.D. Huntley 718; Moll 3398; C.J. Ward 2780, 6446, 6838, 6839, 7570.*

Description: C.B. Clarke: 170 (1897/98).

Distribution: Coast, Midlands, Zululand, Maputaland.

Plants tufted, hard-textured perennials with radiating stiff leaves shorter than culms, shoots surrounded by persistent, usually dark leaf bases. Grow in open exposed situations in wooded scrubland throughout sub-Saharan Africa.

Variation in inflorescence from a branching anthela to a compacted head; in glume colour from fawn to mid-brown to deep blackish red; in spikelet length from normal

3–12 mm to up to 20 mm, exaggerated length not always constant within an inflorescence. It is not surprising so many names have been applied (Kükenthal 1936 delimited seven varieties, but none were maintained by R.W. Haines & Lye 1983).

In Natal, plants grow in coarse open scrub or in grassland. Habit easily recognised, also the stiff, shining spikelets with glumes rather laxly imbricated. If doubt exists as to identity, glumes should be closely examined: a single lateral nerve on each flank runs almost obliquely (but slightly closer to midrib) from apex to base. No close relatives in Natal. Nearest in general facies is *Pycreus atribulbus*, but habitats are different for each taxon.

43. **Cyperus tenuispica** *Steud*., Synopsis plantarum glumacearum : 11 (1855); Kük.: 245 (1936); Podlech: 18 (1967); Kern: 625 (1974); R.W. Haines & Lye: 167 (1983). Type: India, Mangalore, *Hohenacker 1607*.

C. haspan (*halpan*) Rottb.: 36 (1773) non L.

Icones: Rottb.: t. 6, fig. 2 (1773) as *Cyperus haspan* (*halpan*); Kern: fig. 58 (1974); R.W. Haines & Lye: figs 313, 314 (1983); Vanden Berghen: fig. 157 (1988).

Voucher: *Cl. Reid 1057* (PRE).

Description: R.W. Haines & Lye: 167 (1983).

Distribution: Maputaland (Muzi Swamp system).

Widely distributed in warm regions of eastern hemisphere; tropical Africa, Sri Lanka, Nepal, India, Malesia, China, Japan and Australia.

Plants annual, or perennial when favourable conditions are maintained; very variable in height, number of culms, size of inflorescence and extent of leaf blade development (often basal leaves reduced to sheaths). Relationship with tropical and very variable *C. halpan* L. (often incorrectly written *haspan*) is close but *C. tenuispica* may be distinguished by small recurved mucro of obtuse glumes, 1 or 2 stamens per floret with smooth apex of connective (crested in *C. halpan*) and minute achenes 0.4–0.5 × 0.2–0.3 mm.

Frequent in Mozambique, but only rarely collected in Maputaland. A weedy species of cultivation, especially rice cultivation, that may well have been overlooked. The allied *C. halpan* has not yet been recorded for Natal, but should be looked for, as it is common in eastern Zimbabwe and in Mozambique.

44. **Cyperus textilis** *Thunb*., Prodromus plantarum capensium: 18 (1794); Thunb.: 100 (1823); Nees: 513 (1832); Nees: 135 (1835); Kunth: 32 (1837); Steud.: 19 (1855); C.B. Clarke: 579 (1894b); Boeck.: 567 (1867/68); C.B. Clarke: 174 (1897/98); Schönland: 26 (1922); Kük.: 191 (1936).

C. asperifolius Desf.: 387 (1829); Kunth: 114 (1837); Steud.: 59 (1855).

C. burchellii Schrad.: 11 (1832b); Nees: 135 (1835); Kunth: 33 (1837); Steud.: 20 (1855).

C. smithii Schrad.: 12 (1832b) in note; Nees: 135 (1835); Kunth: 115 (1837).

Icones: Schönland: t. 14 (1922).

Vouchers: *Moll 1066; C.J. Ward 462, 4678.*

Description: C.B. Clarke: 174 (1897/98).

Distribution: Coast (mainly south, but there are records from north of Durban), Midlands.

The most significant difference by which *C. textilis* is distinguishable from *C. alternifolius* subsp. *flabelliformis* and *C. sexangularis* (Nos 3, 39) is by the terete culms, smooth throughout their length and especially immediately under inflorescence. Bracts of inflorescence (8–12 in number) generally under 100 mm long, each tipped by acute, penetrating apex.

Schönland (1922) gives the distribution of *C. textilis* in southern Africa as ‘In the coast districts of South Africa, from Clanwilliam to Natal’ whereas Clarke (1897/98) remarks ‘This is a colonist near Bordeaux, and has been collected in Algiers by Munby. Cultivated in Mauritius, according to Bojer.’ If *C. textilis* is a good southern African endemic species [Kükenthal (1936) records it from no other part of the world], it seems strange that in 1897/98 Clarke was able to write as he did of its presence in the northern hemisphere. Is it possible *C. textilis* is synonymous with typical *C. alternifolius* and was introduced to the Cape from where it escaped and became naturalised? The long straight culms of *C. textilis*, like those of typical *C. alternifolius* in other parts of the world, are used for weaving, hence, probably the epithet ‘textilis’. Its common name is ‘matjiesgoed’ (Levyns 1950).

Plants in Natal referable to *C. textilis* grow gregariously in swampland and along rivers and streamlets.

45. **Cyperus thorncroftii** *McClean* in Bothalia 2: 366 (1927a); Kük.: 258 (1936). Syntypes: Transvaal, Barberton Dist., *Thorncroft 39* (K), *2889* (PRE).

Icones: McClean: 367 (1927a).

Vouchers: *Letley s.n.; C.J. Ward 1657.*

Description: McClean: 366 (1927a).

Distribution: Zululand.

Plants tufted, glabrous, leaf-bearing perennials with limited rooting system (abbreviated rhizome merely holds shoots together). Culms variable in height from 120–400 mm. Leaves numerous or few, about 1.0 mm wide, channelled above; developed from pale sheaths with whitish membranous zone that eventually splits to loosen sheath from shoot. Sheaths sometimes persist to form a thin protective investment that may become somewhat fibrous. Inflorescence: head of about 10–20, parallel-sided chestnut spikelets subtended by 1–3 leaf-like bracts, the main (up to 90 mm long) eventually reflexed against culm. Spikelets, ± 1.5 mm wide, vary from 8–20 mm in length. Glumes 2.9–3.0 × 1.2–1.5 mm, have excurrent apiculate apices.

This species reaches its southernmost distributional limit in Zululand where plants may grow in mixed grassland, but more often in the shallow mossy soil over granitic or rhyolytic outcrops. Occurs through Transvaal and Swaziland. Frequent in Zimbabwe where it is generally named *C. kirkii* C.B. Clarke (syntypes Mozambique, near Lupata, *Kirk s.n.* (K); Nyasaland (Malawi), Manganja Hills, *Meller s.n.* (K). The Zimbabwean plants generally have slightly shorter glumes (2.2–2.5 × 1.0–1.25 mm) and as the types have not yet been critically examined, the Natal plants are maintained under *C. thorncroftii.*

Kükenthal (1936) cited *Thorncroft 2889* as *C. remotiflorus* Kük. and *Ward 1657* has been placed under *C. rupestris* Kunth var. *rupestris* by other workers. *C. thorncroftii* is certainly closely related to both these taxa. A comprehensive survey is required in southern Africa and further north.

46. **Cyperus usitatus** *Burch.*, Travels in the interior of southern Africa 1: 417 (1822) in note; Nees: 285 (1834b) excl. syn.; Nees: 136 (1835); Kunth: 107 (1837); Steud.: 58 (1855); Boeck.: 511 (1867/68); C.B. Clarke: 176 (1884) excl. syn. *C. semitrifidus*; C.B. Clarke: 581 (1894b); C.B. Clarke: 179 (1897/98); C.B. Clarke: 353 (1901/02); Schönland: 27 (1922); Kük.: 122 (1935); Podlech: 18 (1967); P.L. Forbes: 46 (1987b). Type: from South Africa.

C. bulbifer Drège: 63 (1843) name only.

C. bulbifex Drège: 245 (1847).

C. edulis Dinter: 41 (1909).

Icones: C.B. Clarke: t. 16, fig. 1 (1909); Schönland: 27 (1922).

Description: C.B. Clarke: 179 (1897/98).

var. *usitatus*

Icones: R.W. Haines & Lye: fig. 376 (1983).

Voucher: *Johnstone 3.*

Description: R.W. Haines & Lye: 192 (1983).

Distribution: N Natal (Dundee area).

Typical phase: perennial, leaf-bearing plants 100–300 mm high carrying single head-like inflorescences of dark brown to blackish (rarely paler brown) spikelets arranged spicately, but so congested that this arrangement is difficult to observe (occasionally inflorescence may be slightly open with rays so short as to be hardly developed). Readily identified by underground organs that consist of (from base of each shoot) a short scale-invested stolon ending in a scaly bulb (as distinct from the tubers of other species). Slender lateral stolons, that may terminate in bulbs, or not, are also usually present.

Plants rare in Natal, being known from marshy ground where they were said to be locally common. Much better represented in drier more central and western parts of southern Africa.

Other varieties [with large bulbs, var. *macrobulbus* Kük. or open, more ample inflorescences var. *stuhlmannii* (C.B. Clarke) Lye], are represented in tropical Africa.

47. **Cyperus zollingeri** *Steud.* in Zoll.: 62 (1854) name; Steud.: 17 (1855); Boeck.: 352 (1869/70); C.B. Clarke: 581 (1894b); K. Schum.: 120 (1895); Kük.: 133 (1935); Kern: 608 (1974); R.W. Haines & Lye: 196 (1983). Type: Java, *Zollinger 2689.*

C. ramosii Kük.: 326 (1925); Kük.: 136 (1935). Type: Philippines, Luzon, *Ramos 7672.*

Icones: R.W. Haines & Lye: fig. 387 (1983); T. Koyama: fig. 11 G–M (1985); Vanden Berghen: fig. 159 (1988).

Vouchers: *Bourquin 421; Strey 7669; C.J. Ward 6165.*

Description: R.W. Haines & Lye: 196 (1983).

Distribution: Coast, Maputaland.

Plants slender to more or less tufted annuals, variable in height, with fibrous roots. Inflorescences anthelate, each ray up to 150 mm long (some shorter), smooth, bearing 2–6 spicate to subspicate spikelets on a short axis. Most easily recognised by long (up to 25 mm) greenish grey spikelets (brownish to fawn when dry) that are hardly compressed, rather almost terete or 4-angled.

Distribution of the species is tropical Africa, Madagascar, Malesia and northern Australia. In the literature (C.B. Clarke: 360, 1901/02) there has been some confusion with *C. tenuiculmis* Boeck., a perennial, often stoloniferous species not recorded for southern Africa.

0469010 ELEOCHARIS

Eleocharis *R. Br.*, Prodromus florae novae hollandiae et insulae Van-Diemen: 224 (1810); Kunth: 139 (1837); Steud.: 75 (1855); Boeck.: 418 (1869/70); C.B. Clarke: 197 (1897/98); C.B. Clarke: 404 (1901/02); Schönland: 33 (1922); Svenson: 2 (1939); Podlech: 18 (1967); R.A. Dyer: 884 (1976); R.W. Haines & Lye: 64 (1983); P.L. Forbes: 46 (1987b). Type species: *E. palustris* (L.) Roem. & Schult. (*Scirpus palustris* L.). [Note: T. Koyama: 255 (1985) gives the type species as *E. capitata* R. Br. = *E. geniculata* (L.) Roem. & Schult.].

Limnochloa P. Beauv. ex T. Lestib.: 41 (1819) (no type stated).

Heleocharis T. Lestib.: 41 (1819); Lindl.: 281 (1829); Levyns: 108 (1950).

Eleogenus Nees: 294 (1834b). Type: *Eleogenus capitatus* (R. Br.) Nees.

Chaetocyperus Nees: 289 (1834b). Type: *Chaetocyperus setaceus* (Retz.) Nees (= *Eleocharis chaetaria* Roem. & Schult.)

Chlorocharis Rikli: 564 (1895).

Key to species

1a Culm septate. Plant perennial with robust, rounded, hollow, air-filled culms wider than the terminal inflorescence . . . 5. *E. dulcis*
1b Culm not septate 2

2a Culm triangular. Glumes tough, closely longitudinally veined, obtuse with a narrow, translucent membranous margin that soon wears away. Achene surface trabeculate. Style base dark coloured, set upon a definite neck of the achene body . . . . 1. *E. acutangula*
2b Culm not triangular. Glumes not precisely as in the contrast. Achene surface not trabeculate. Style base, if dark coloured then longer than wide, usually set directly upon the gradually narrowing body of the achene, if a neck developed, this very short 3

3a Inflorescences (at least the majority on a plant) not longer than 10 mm. Plants soft-textured, EITHER short, fragile ephemeral (*E. atropurpurea*), OR more robust and up to 150 mm with slender lateral stolons (*E. caduca*), OR to 200 mm and lacking stolons, heads spherical, not ovate at maturity of achenes (*E. geniculata*) 4
3b Inflorescences (at least the majority on a plant) longer than 10 mm, usually 15–36 mm long. Plants tougher perennials (mostly emergent from water) with strong rhizomes and often thick elongate stolons 6

4a Plants dwarf annuals with delicate rooting system. Glumes ± 1 mm long, all fertile (basal bracts of inflorescence lacking). Mature achenes black, shining, smooth with flattened style base. Perianth bristles delicate, white, usually shorter than the achene and style base, sometimes lacking. Stamen usually 1, occasionally 2 . . . . 2. *E. atropurpurea*
4b Plants more robust up to 150 (occasionally to 200) mm high. Glumes ± 2 mm long. Other criteria not precisely as for the contrast 5

5a Plants with stolons. Spikelets (at maturity of the achenes) ovate, usually 2–4 × 1–2 mm. Perianth bristles brown, firm, with well-developed retrorse barbs . . . . 3. *E. caduca*
5b Plants lacking stolons. Spikelets (at maturity of achenes) round (spherical), usually 3–4 × 2.5–3.5 mm. Perianth bristles pinkish, hardly bristly in texture, glabrous or with poorly developed retrorse barbs towards apex . . . . 6. *E. geniculata*

6a Mature achenes (excluding style base) 0.95–1.10 × 0.70–0.85 mm; style base 0.35 mm long. Culms not fully terete, but with some degree of flattening or longitudinal folding. Longest spikelet on a plant usually not exceeding 20 mm. Spikelets not exhibiting vegetative proliferation . . . . 4. *E. dregeana*
6b Mature achenes (excluding style base) 1.3–1.5 × 0.85–1.0 mm; style base 0.4–0.5 mm long. Culms terete, filled with pale brown pith. Longest spikelet on a plant from 23–36 mm. Spikelets usually exhibiting vegetative proliferation except in southern Natal and in the Uplands where glume coloration is very dark brown (elsewhere paler and glumes more membranous) . . . . 7. *E. limosa*

1. **Eleocharis acutangula** *(Roxb.) Schult.* in Mantissa in volumen secundum: 11 (1824); Kern: 525 (1974); R.W. Haines & Lye: 67 (1983); T. Koyama: 256 (1985) as *E. actangula*; Vanden Berghen: 221 (1988). Type: from India. Figure 28A.

Scirpus acutangulus Roxb.: 216 (1820).

S. medius Roxb.: 216 (1820). *Limnochloa media* (Roxb.) Nees: 114 (1834a). Type: from India.

S. fistulosus Poir.: 749 (1804); Thwaites: 434 (1864).

E. fistulosa (Poir.) Schult. : 89 (1824); Thwaites: 351 (1864); C.B. Clarke: 626 (1893/94); C.B. Clarke: 198 (1897/98); C.B. Clarke: 406 (1901/02); Svenson: 152 (1929). Type: from Madagascar; not of Forssk. (1775).

Icones: R.W. Haines & Lye: fig. 93 (1983); Vanden Berghen: fig. 161 (1988).

Vouchers: *Feely & Ward 15; P.B. Taylor 131.*

Description: R.W. Haines & Lye: 67 (1983).

Distribution: Midlands, Maputaland.

Has not been collected often in Natal but may be better represented than records indicate. Plants grow rooted in dams in permanent water up to 0.5 m in depth. (This may be a reason for its sparse collection). The triangular culms are the best means of recognition of the species in the field, but an achene should always be checked to confirm identification by the longitudinally striate and trabeculate markings of its surface and the presence of the neck-like constriction below the connection with the style base. The glumes are also worthy of note, being hard and closely longitudinally veined with a transparent membranous margin that soon wears away.

In a farm dam near Howick, typical plants of *E. acutangula* were found in the deeper parts, while in shallower water with *E. dregeana*, were plants with some of the features of *E. acutangula* but other features characteristic of *E. dregeana* (*P.B. Taylor 131, 132*).

2. **Eleocharis atropurpurea** *(Retz.) C. Presl* in Reliquiae Haenkeanae 1: 196 (1828) excluding specimen citations; Kunth: 151 (1837); C.B. Clarke: 407 (1901/02); Svenson: 227 (1929); Podlech: 20 (1967); R.W. Haines & Lye: 72 (1983); P.L. Forbes: 47 (1987b). Type: India, *Koenig s.n.* Figure 28B.

Scirpus atropurpureus Retz.: 14 (1788).

Icones: Svenson: t. 191, fig. 49 (1929); R.W. Haines & Lye: figs 104, 105 (1983); Vanden Berghen: fig. 162 (1988).

Vouchers: *Cl. Reid 1053* (PRE); *Hitchins 827* (PRE).

Description: R.W. Haines & Lye: 72 (1983).

Distribution: Maputaland.

Plants are dwarf, fragile annuals growing in alluvium close to water, or otherwise in disturbed, more or less open wet areas, especially where cultivation has been discontinued. Perhaps quite often overlooked.

Most easily recognised by black, shiny, smooth achene (0.5 × 0.4 mm) carrying a minute vertically flattened style base; delicate, glistening white bristles generally shorter than achene but with length variable, (sometimes lacking) and the 1 stamen (2 present in tropical African specimens). There are said to be two sheaths above the prophyll on each culm, but this is

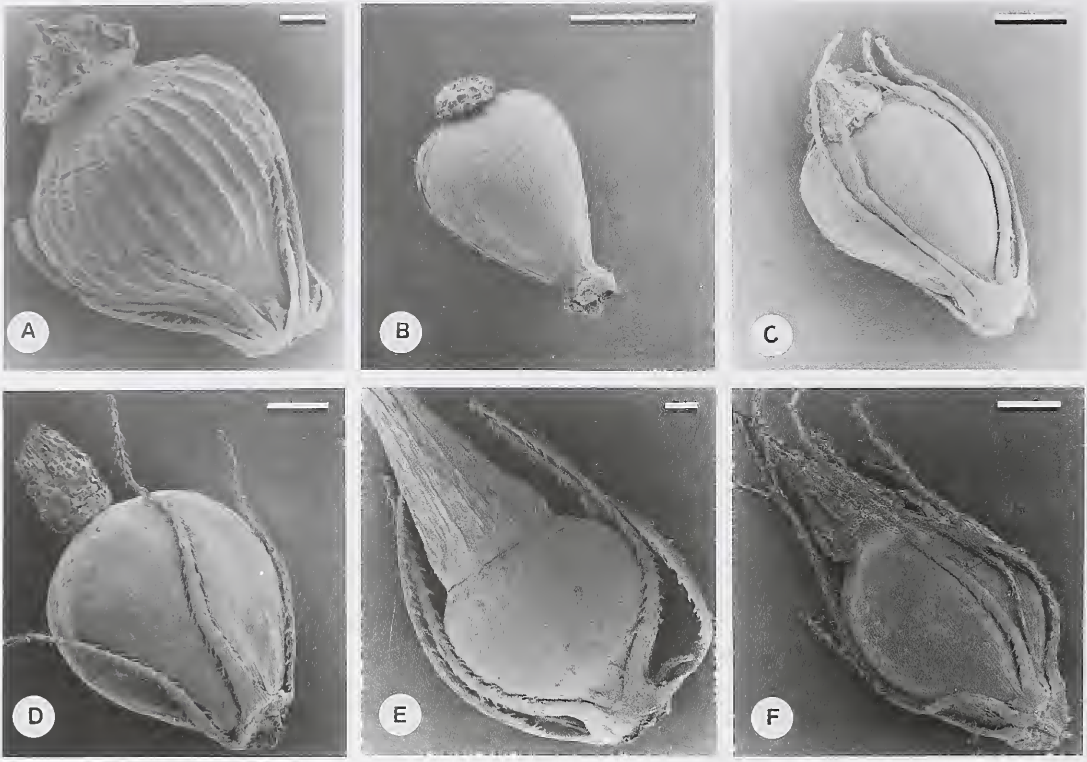

FIGURE 28.—*Eleocharis*. A, *E. acutangula*, *Feely & Ward 15*; B, *E. atropurpurea*, *Cl. Reid 1053* (PRE); C, *E. caduca*, *K.D. Gordon-Gray s.n.*; D, *E. dregeana*, *Drège s.n.* (K); E, *E. dulcis*, *Gillissen 432*; F, *E. limosa*, *Ward 2738*. Scale bar: A–F, 250 µm.

not easily observed. Sheath mouth oblique, sometimes with short leaf blade developed. Glumes obtuse, about 1 mm long, all fertile. Inflorescence bract(s) do not develop which is somewhat unusual for the genus.

3. **Eleocharis caduca** *(Delile) Schult.* in Mantissa in volumen secundum: 88 (1824); R.W. Haines & Lye: 71 (1983). Type: Egypt, Damietta, collector unknown (P). Figure 28C.

Scirpus caducus Delile: 153 (1814).

E. intricata Kük.: 135 (1914).

E. madagascariensis Cherm.: 284 (1928).

Icones: R.W. Haines & Lye: fig. 103 (1983).

Vouchers: *Pooley 2181; C.J. Ward 1312, 3262, 3475, 4303, 8129, 9094, 9482, 9969.*

Description: R.W. Haines & Lye: 71 (1983).

Distribution: Coast, Maputaland.

Colonies of plants frequent along entire Natal coastline where there are freshwater seeps; in sand, often among rocks; also in alluvium of coastal rivers and streamlets. They spread by means of fine stolons. Species reported as annual, but more often perennial, persisting wherever habitat conditions permit. Plant height is ± 30–150 mm. Leaf sheaths membranous and slightly constricted apically, truncate but for a slight elongation marking the position of reduced blade. One sterile bract subtends each inflorescence. Glumes markedly obtuse. Stamens 3. Style branches 2.

The more tropical *E. geniculata* (L.) Roem. & Schult. (No. 6) is present along the Mozambique coastline and may extend into Maputaland. Distinguished from the similar looking *E. caduca* in being annual (lacking stolons) and in the round (spherical) inflorescences (in *E. caduca* twice as long as wide). Hypogynous bristles also differ, being firm, brown and retrorsely barbed in *E. caduca*; soft, pinkish brown and smooth in *E. geniculata*. Resemblance is close, however, and until spikelets are fully mature, confusion is possible.

Note: Svenson (1939: 52) cited *E. caduca* as a synonym of *E. geniculata*. This is not always accepted. Personally, I believe it to be correct, although not followed here. Further study in relation to distribution and habitat conditions is needed.

4. **Eleocharis dregeana** *Steud.*, Synopsis plantarum glumacearum Pars 2, Cyperaceae: 78 (1855); Svenson: 61 (1939); P.L. Forbes: 47 (1987b); Hilliard: 57 (1987). Type: *Drège*, without number or locality (P); but in (K) is a Drège gathering (Cape Province, 'Vicinity of Stylkloof near Richmond, 4000–5000 ft., Dec., Richmond Div.') that carries a label that reads '*Eleo-charis dregeana* Steud. probably from the type collection. det. H.K. Svenson 1938!' (Mature achenes present; style branches 2). Figures 28D; 29.

Icones: Svenson: t. 543, fig. 2 (1939); Davis in Hilliard: 57 (1987).

Vouchers: *Edwards 1050, 2349; Hilliard & B.L. Burtt 14104; Moll 1109, 2395, 5171; C.J. Ward 3819.*

Description: Svenson: 61 (1939).

Distribution: widespread, but unusual at the coast.

Note: in applying the name *E. dregeana* Steud., Svenson is followed. This author undertook a monographic account of world species of *Eleocharis* (Svenson 1929, 1932, 1934, 1937, 1939) in which he named *Burchell 2649, 3046*, as *E. dregeana*. These specimens, from the Cape Province, agree with many Natal plants. However,

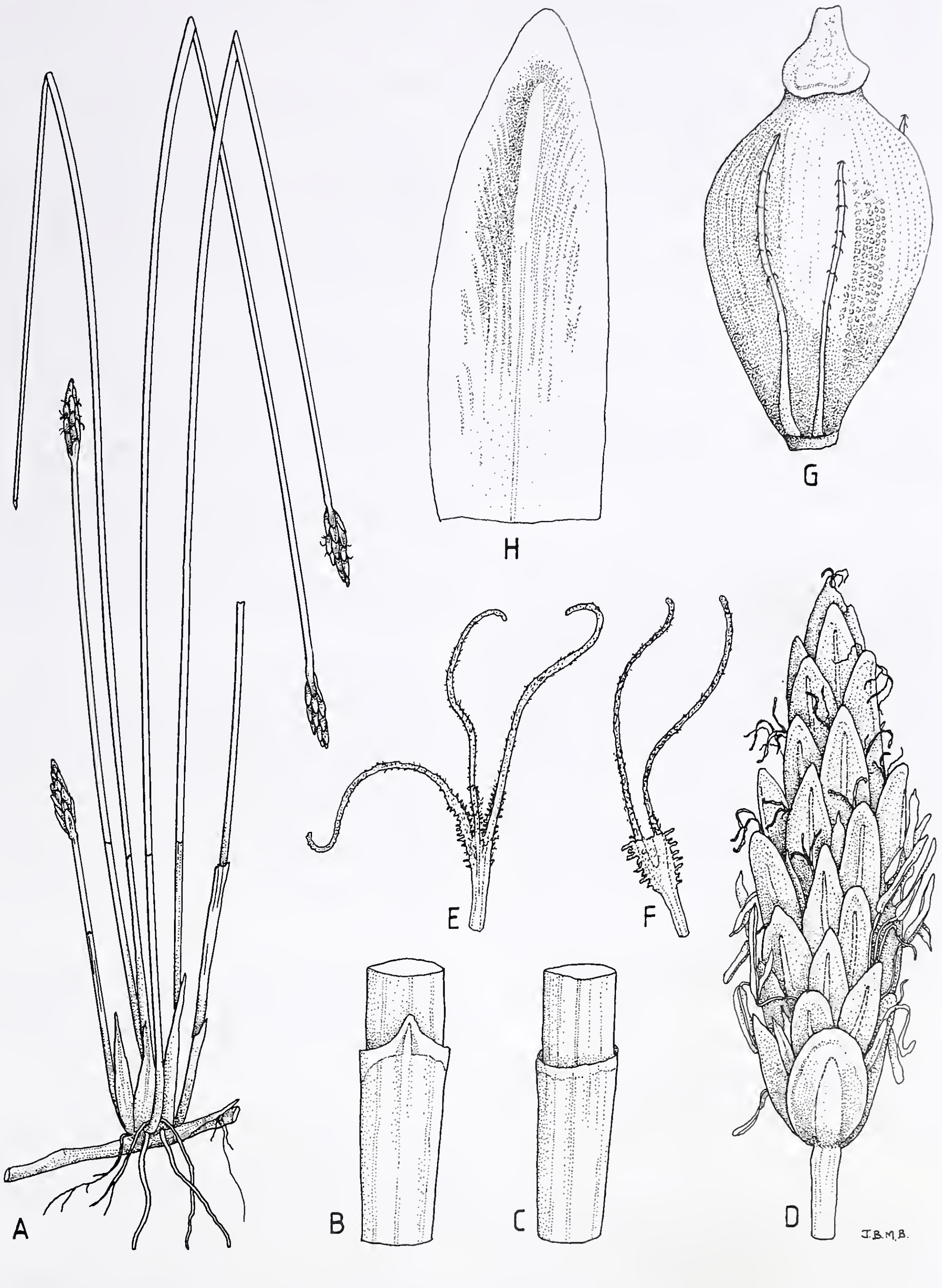

FIGURE 29.—*Eleocharis dregeana*. A, portion of plant, × 1; B, C, detail of leaf sheath, × 7; D, spikelet, × 8; E, F, styles with 3 and 2 branches respectively, × 48; G, achene with bristles, × 41; H, glume, abaxial view, × 27. A–F, H, *P. B. Taylor 3*; G, *K.D. Gordon-Gray s.n.*

Simpson (1988) has pointed out that while Svenson's account is thorough in many ways, features such as stamen number and morphology were not adequately considered, so that revision is required. Svenson did not apply the name *E. palustris* R. Br. to any southern African specimens. It is correctly used for a species predominantly of the northern hemisphere (there widespread and extremely variable) that bears close relationship to the southern *E. dregeana*. Unfortunately, Clarke (1897/98) had previously misapplied *E. palustris* to South African specimens (including the *Burchell 2649, 3406* gatherings) and this name has been taken up by subsequent workers. Recently Forbes (1987b) for the Witwatersrand area of the Transvaal, listed *E. palustris* (with 3-branched style) as common; *E. dregeana* (with 2-branched style) as rare. She mentioned the presence of occasional intermediates in which style branch number was 2 or 3 within a spikelet.

In a recent publication covering the British Isles and NW Europe, Rose (1989) described only 2 style branches for *E. palustris* and a style base with a broad basal rim, beneath which is an obvious constriction at its junction with the achene. South African plants named *E. dregeana* appear to lack this broad basal rim.

In Natal, plants seem to have a predominance of 3-branched styles, but the smaller number is also represented, as are plants with both numbers within a single spikelet.

A comprehensive field survey in Natal and southern Africa is required. Pending this, the entity to which the name *E. dregeana* is applied, is delimited here on characters other than style branch number (see key). In this sense, plants rhizomatous, stoloniferous perennial emergents growing in permanent, usually fairly shallow water of vleis, streamlets and dams. Large tufts usually formed. Culms are closely packed, not quite terete, but showing some slight flattening or folding. Relatively short spikelets (longest on a plant not exceeding 20 mm) comprise dark brown glumes each with an acute membranous apex that extends only a short distance down the margins. Achenes golden to dark brown, 0.95–1.10 mm long (excluding style base) × 0.7–0.85 mm wide with hypogynous bristles (usually 4) about as long as the achene and style base together. Style base ± 0.35 mm long, roughly the shape of an equilateral triangle in outline. Photosynthetic leaf blades never developed. Sheath apices truncate with no prolongation of a reduced blade except a minute notch. Inflorescences do not exhibit vegetative proliferation.

The species seems commonest in the Midlands and N Natal; present, but not as frequent, in the Uplands and in Zululand; hardly represented at the coast, especially southwards. This is, however a tentative evaluation. There has been much confusion with *E. limosa* (No. 7).

5. **Eleocharis dulcis** *(Burm. f.) Hensch.*, Clavis herbarii amboinensis in vita G.E. Rumphii: 186 (1833); Svenson: 158 (1929); Kern: 529 (1974); R.W. Haines & Lye: 66 (1983); T. Koyama: 259 (1985). Type: East Indies, based on *Cyperus dulcis* Rumph.: 7 (1750). Figure 28E.

Andropogon dulce Burm. f.: 219 (1768).

Scirpus plantaginoides Rottb.: 45 (1773). Type: from India.

S. plantagineus Retz.: 14 (1788). *E. plantaginea* (Retz.) Roem. & Schult. : 150 (1817); C.B. Clarke: 405 (1901/02). Type: India, Koenig.

Icones: Rumph.: t. 3, fig. 1 (1750); Rottb.: t. 15, fig. 2 (1773); Svenson: t. 537, fig. 6 (1937); R.W. Haines & Lye: fig. 89 (1983); Vanden Berghen: fig. 167 (1988).

Vouchers: *Fannin s.n. per K.D. Gordon-Gray; Tinley 296; Ward & Raiman 8.*

Description: R.W. Haines & Lye: 66 (1983).

Distribution: Coast (Durban area), Maputaland.

Robust, stoloniferous perennial plants are tufted emergents growing in permanent fresh water of vleis and pans. They are recognisable by the culm that usually is wider than the terminal solitary spikelet. Breakage shows the culm to be septate, otherwise hollow and air-filled, lacking pith. Plants are uncommon in Natal.

A cultivated form of this species is the 'Chinese water chestnut'. The crisp, apple-flavoured tubers that terminate the stolons are eaten raw or made into chips (Kern 1974). Unfortunately, Natal plants lack these tubers! Svenson (1929) suggests several entities may be incorporated in this widely distributed species.

6. **Eleocharis geniculata** *(L.) Roem. & Schult.*, Systema vegetabilium 2: 150 (1817); Svenson: 50 (1939); Kern: 536 (1974); R.W. Haines & Lye: 70 (1983); T. Koyama: 264 (1985). Type: Jamaica; Hortus Siccus Cliffortianus (BM, lectotype selected *Furtado 1937*) [see Wilson (1990)].

Scirpus caribaeus Rottb.: 24 (1772); Rottb.: 46 (1773). *E. caribaea* (Rottb.) S.F. Blake: 24 (1918).

S. capitatus Willd. non L. *E. capitata* R. Br.: 225 (1810); Kunth: 150 (1837); Boeck.: 461 (1869/70); C.B. Clarke: 407 (1901/02).

Icones: Rottb.: t. 15, fig. 3 (1773); R.W. Haines & Lye: fig. 101 (1983); Vanden Berghen: fig. 168 (1988).

Voucher: *Heard 2085* (Lake Sibayi).

Description: R.W. Haines & Lye: 70 (1983).

Distribution: Maputaland coast (rare), frequent along Mozambique coast.

In the literature, plants are repeatedly described as annual, with fibrous roots and no stolons. Also characterised by capitate (spherical) spikelets that on dissection reveal florets with sparingly retrorsely-scabrous hypogynous bristles and achenes that, at maturity, are shiny black.

Few plants adequately fulfilling these characteristics have been recorded for Maputaland, but more may be present in association with the closely related *E. caduca*. Further field studies to assess local populations are needed.

7. **Eleocharis limosa** *(Schrad.) Schult.*, Mantissa in volumen secundum systematis vegetabilium 2: 87 (1824); C.B. Clarke: 198 (1897/98); Schönland: 33 (1922); Sven-

son: 97 (1939); Podlech: 20 (1967). Type: Cape Province, *Hesse* (K). Figure 28F.

Scirpus limosus Schrad.: 2069 (1821); Schrad.: 129 (1832b).

Icones: Schrad.: t. 2, fig. 1 (1832b); Schönland: t. 26 (1922); Svenson: t. 539, fig. 6 (1939).

Vouchers: *Pooley 1943; C.J. Ward 461, 2738, 5454 8697* (northern phase); *Hilliard & B.L. Burtt 14105, 16995, 18375* (southern phase).

Description: Svenson: 97 (1939).

Distribution: Coast, Maputaland, (northern phase); southern Natal, Kokstad, Uplands (southern phase).

Plants rhizomatous, perennial emergents rooted in usually sandy substrates of vleis and pans, either in permanent water, or towards margins where levels may fluctuate. Stolons not developed (as in *E. dregeana*), rhizome, as a rule, uniseriate, with culms contiguous, or almost so. Culms terete, without lateral flattening or folding (as in *E. dregeana*), even when dry. Great variation in width, generally from 3–5 mm, but occasionally in the same plant from 5–10 mm (old culms) to 2–4 mm (culms growing up from the proliferating inflorescence that has lodged and rooted). Vegetative organs frequently glaucous (the faint bluish coloration persists in the herbarium). Inflorescences, whitish, fawn or greyish brown, variable in length, the longest on a plant generally 15–36 mm (under 15 mm in *E. dregeana*). The pale inflorescence colour results from glumes that are brown centrally, but with a wide membranous zone to the flanks and the acute apex. Stamens 3. Style branches predominantly 3, but there is reduction to 2 (often in one spikelet). Style base is the shape of an isosceles triangle in outline (an equilateral triangle in *E. dregeana*).

What has been considered up to now is what is tentatively called here, the northern Natal phase of the species. Its distribution is almost exclusively coastal, including Maputaland. Southwards along coast and inland to Kokstad area and mountains of southern Drakensberg (Natal, Lesotho and eastern Cape) the glaucous look of the plants is lost; glumes become dark (at higher altitudes, very dark brown) and the facies resembles that of plants of *E. dregeana* more closely. However, the measurements of length (spikelet; achene body; style base) (see key) that most readily distinguish *E. limosa* from *E. dregeana* are maintained. This is referred to as the 'southern phase'. Further investigation is required to determine whether these 'northern' and 'southern' variants are worthy of subspecific status. It should be noted that the type of *E. limosa* is from the Cape. In the Cape, the 'northern phase' is again present, but this requires special study.

There has been much confusion between *E. limosa* and *E. dregeana* (including specimens named *E. palustris*) and it is a possibility that some of the early collections were mixed gatherings. The confusion has been exacerbated by the variation in style branch number in both taxa. Svenson (1939) was aware of this variability and commented that names based essentially on number of style branches, as in some early treatments, might prove misleading.

Another source of confusion may have been that the tropical African *E. marginulata* Steud. (recorded for Botswana and Zimbabwe) has an earlier synonym, *E. limosa* A. Rich. non Schult. *E. marginulata* has shorter bristles than those of *E. dregeana*. Plants are more robust with a much thicker, stronger rhizome and more elongate stolons, but in general facies there is similarity.

0465000 **FICINIA**

Ficinia *Schrad.* nom. conserv. **Ficinia** *Schrad.* in Commentationes societatis regiae scientiarum gottingensis recentiores, Sér. 2, 7: 142 (1832a); Schrad.: 44 (1832b); C.B. Clarke: 235 (1897/98); C.B. Clarke: 460 (1901/02); Pfeifer: 14 (1921); Schönland: 41 (1922); Podlech: 21 (1967); R.A. Dyer: 883 (1976); T. H. Arnold: 45 (1975). Type species: *F. filiformis* (Lam.) Schrad., type conserved.

Note: *Ficinia* has an extensive synonymy that is not included here, see Arnold (1975). It is probable that when fully known, the genus may require some dismemberment.

Key to species

Note: *Ficinia* is still inadequately known in Natal. Features of the sheath mouth and ligule are important in identification (Figure 30). To observe the gynophore accurately, mature achenes are required.

1a Glumes slightly hooded, their margins fringed with irregular fingers of tissue that wear away with age (examine younger examples). Coastal, usually in sand .... 6. *F. laciniata*
1b Glumes not hooded, their margins usually entire, membranous or not, but never fringed with irregular fingers of tissue. Coast to Uplands 2

2a Plants with leaf blades reduced to 30 mm or less in length; if longer, then very fine, not exceeding 0.5 mm in width. Culms basally invested by a succession of leaf sheaths each inner one longer than its predecessor, often deep brownish to purplish red. Culms either erect, or long and flexuous; always the important photosynthetic organs 3
2b Plants with well-developed photosynthetic leaf blades, usually wiry in texture. Basal leaf sheaths variable. Culms erect or slightly nodding at maturity 4

3a Inflorescence a small head consisting of 1–4 spikelets terminating the culm .... 4. *F. filiculmea*
3b Inflorescence branched, consisting of a variable number of spikelets (well exceeding 4) terminating the culm in a staggered group .... 3. *F. fascicularis*

4a Ligule lacking (best seen on innermost leaf surrounding a culm); sheath mouth sloping inwards and downwards towards point of attachment of blade (Figure 30A1, A2). Mature achene loosely invested in its basal quarter by a thin cream to yellowish brown gynophore that covers the achene rather than forms a podium to it; gynophore 3-lobed, lobes usually coarsely dentate. Achene (including gynophore) 1.5–2.3 × 1.1–1.3 mm; dark brownish-blackish with fine greyish white overlay; surface minutely cellular, appearing smooth at low magnification .... 8. *F. sp. A.*

4b Ligule present, taking various forms (often breaking down early: best to examine the inner leaves of several shoots). Sheath mouth truncate or sloping outwards and downwards away from highest point of ligule, never inwards and downwards towards the leaf blade as in the contrast (Figure 30B, C). Mature achene and gynophore not precisely as for the contrast 5

5a Ligule at least 5 mm long, a tube of membranous white or yellowish tissue splitting early into fragments remaining near sheath mouth (Figure 30D). Inflorescence of 8–1 sessile spikelets (seldom more), each defined so that heads appear digitate rather than tightly compacted. Glumes obtuse, margin membranous, midnerve terminating below apex (included here is *Ficinia nana* B.L. Burtt) .... 7. *F. stolonifera*

5b Ligule less than 5 mm long; EITHER a cuff-like sheath, OR an extension of membranous tissue within the leaf blade (sometimes variable within a plant: Figure 30B, C). Inflorescence of more than 5 (usually many) spikelets closely aggregated into dense compact heads 6

6a Glume narrowly oblong in profile with an excurrent, outwardly pointing, slender apiculum (± 0.25 mm long). Mature achene (including gynophore) 1.1–1.4 × 0.8–0.95 mm, greyish black with fine greyish white overlay, surface minutely cellular, appearing smooth. Gynophore forming a podium, 0.2–0.3 mm long, yellowish brown, with minutely 3-lobed upper margin .... 1. *F. cinnamomea*

6b Glume elliptic or elliptic-ovate in profile with midvein forming a thick obtuse short projection that may lengthen and recurve in age (never becoming a delicate, markedly outwardly curving apiculum: much more robust and straighter). Mature achene transversely ridged, with gynophore obsolescent at maturity, OR otherwise differing from the contrast 7

7a Mature achene 1.2–1.5 × 0.8–1.3 mm (including the short gynophore), obovate, trigonous, dark brown, surface irregularly transversely ridged. Glume apex rounded with midvein terminating in a blunt point (scarcely prolonged). Anther crest long triangular, 0.2 mm long, basal width approximately equalling that of anther, narrowed above, smooth or scabrid .... 5. *F. gracilis*

7b Mature achene unknown. Glume apex rounded with midvein projecting in a short to slightly elongate blunt, straight or slightly curved apiculum (collectively these midveins are sufficiently developed (at least in some specimens seen) to give spikelets and inflorescence a somewhat shaggy appearance). Anther crest nearly round in outline, densely covered in minute scabridities .... 2. *F. dasystachys*

Note: References to published descriptions and icones have been omitted where precision may be doubtful due to the unwitting inclusion of foreign elements.

1. **Ficinia cinnamomea** *C.B. Clarke* in Conspectus florae africae 5: 637 (1894b) p.p., (excluding *Flanagan 922*); (*Wood 462* non vide) nom. nud.; C.B. Clarke: 246 (1897/98) p.p. (excluding *Buchanan 71*). Type: Natal, Inanda, *Wood 1939* (K, holo.; NH, iso.) Figure 31A, B.

Vouchers: *Esterhuysen 15492* (K); *Stirton 5651* (K, PRE); *C.J. Ward 936, 937, 6343*.

Distribution: Coast (including coastal hinterland, Noodsberg, Inchanga), Uplands.

Review of the history of *F. cinnamomea* has shown that more than one entity was included by Clarke (1894b; 1897/98); details to be published elsewhere. Clarke himself, (1897/98) withdrew *Flanagan 922* to establish this number as the type of *F. dasystachys* (No. 2.). A second entity represented by *Buchanan 71* is now segregated and recognised in this work as species A (No. 8.) (to be named later). Not surprisingly, this 'mixing' led to confusion concerning the identity of *F. cinnamomea*.

Natal plants, in agreement with *Wood 1939* (fortunately both holo- and isotypes carry mature achenes), are loosely tufted leafy perennials, usually with well-

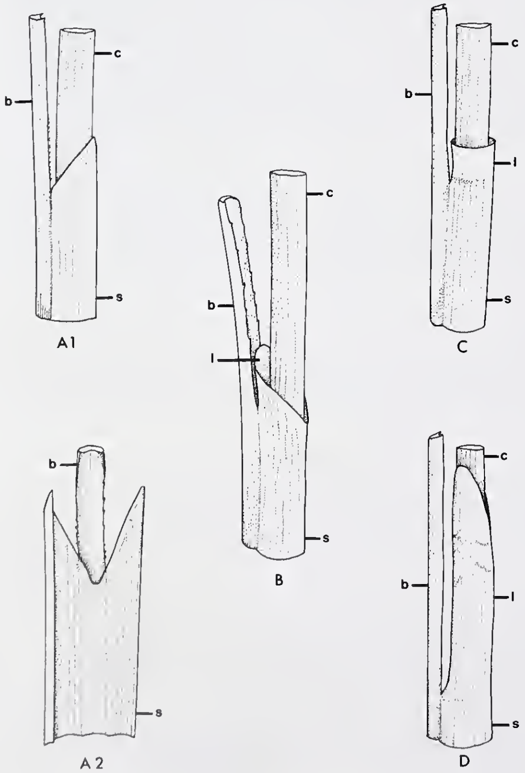

FIGURE 30.—*Ficinia*, leaf sheath apices and ligules in lateral view; A1, sheath mouth sloping inwards and downwards to leaf blade, ligule lacking; A2, sheath of A1, interior view, showing absence of ligule; B, sheath mouth sloping downwards away from leaf blade, ligule a membranous outgrowth within leaf blade; C, sheath mouth truncate, ligule a cuff-shaped collar; D, sheath mouth sloping downwards away from blade, ligule a long, stocking-like enclosing membrane, fragmenting early. c, culm; l, ligule; b, leaf blade; s, membranous sheath.

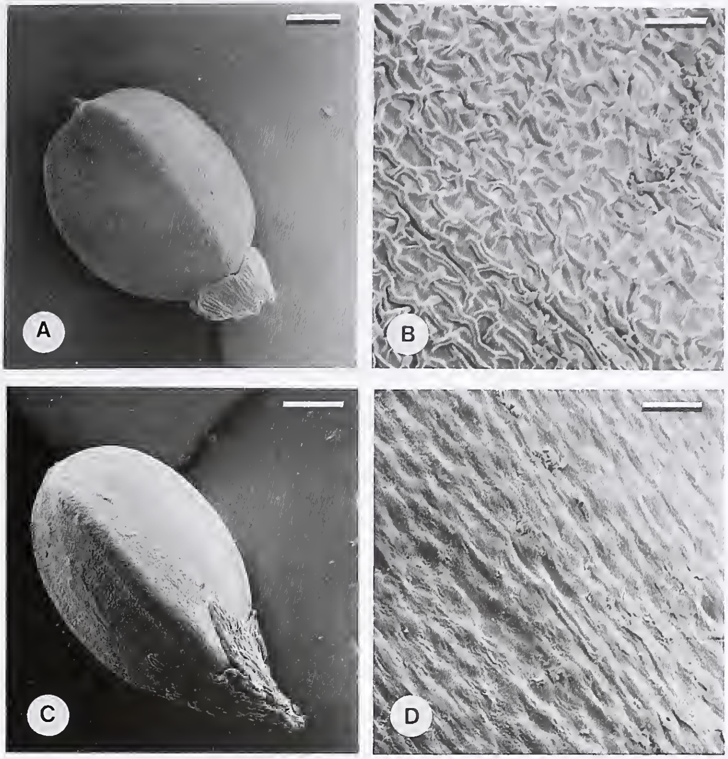

FIGURE 31.—*Ficinia*. A, B, *F. cinnamomea, Stirton 5651* (PRE); C, D, *F. fascicularis, Hilliard & B.L. Burtt 18773*. Scale bars: A, C, 250 µm; B, D, 25 µm.

developed stolons and a slender straggling, or erect growth form, dependent upon whether the microhabitat is rocky and shaded (overhangs and crevices, particularly in sandstone and granite), or more open rather damp grassland. Ligule present. Glume, narrow-oblong in profile with a delicate, outward-curving excurrent apiculum, is the most reliable and convenient diagnostic criterion. Where possible it should be used in conjunction with features of the mature achene (see Key to species and Figure 31).

F. cinnamomea is distinguished from sp. A (with which it has been much confused) by its ligule; sp. A. is eligulate (Figure 30A1, A2). Glumes of both taxa have excurrent midribs, but in *F. cinnamomea* the apiculum is longer, more slender and more outwardly curving (when fully mature). Species A is not known to produce stolons. There is also relationship with *F. dasystachys* in general facies, but the glume structure differs (see Key to species at steps 6a, b; 7b).

2. **Ficinia dasystachys** *C.B. Clarke* in Flora capensis 7: 251 (1897/98); B.L. Burtt: 358 (1986) (excl. *Stirton 5651* K, PRE). Type: Cape Province, Komgha Div., pastures near Komgha, 2000 ft., *Flanagan 922* (K, holo.).

Vouchers: *Abbott 173, 292* (PRE); *A.E. van Wyk 5071* (PRE).

Distribution: Coast.

The specific name applied to *F. dasystachys* reflects 'shaggy spikelets'. Inflorescences in the type are very young and their components hardly fulfil such description. However, there are specimens from southern Natal (cited above) that much better exemplify this characteristic. In these specimens the inflorescence is a hemispherical head of 10–20 close-packed spikelets. The rounded surface of this head would be relatively smooth were it not that the midrib of each of a majority of glumes is slightly prolonged into a blunt, coarse, whitish, straight or slightly outwardly curved projection. Collectively these projections impart a somewhat 'shaggy' appearance to the heads that is accentuated by the anthers when florets are in anthesis. Such specimens agree with the type in general facies and in minutae of leaves, ligule, glumes and anther crests (see Key to species at step 7b), and are tentatively referred to *F. dasystachys* pending further study. The taxon is still inadequately known, however, since mature achenes have not yet been described. Burtt (1986) suspected that a specimen from southern Natal (*Stirton 5651*), might represent *F. dasystachys* and described the achenes for that species, at the same time recording it as new for Natal. However, *Stirton 5651* agrees well with the type of *F. cinnamomea* (*Wood 1939*) and must be placed with that species. The relationship of *F. dasystachys* is with *F. gracilis*, the plants being similar in general facies and in details of vegetative structure. The mature achene, when known, may clarify this relationship.

3. **Ficinia fascicularis** *Nees* in Linnaea 10: 178 (1835); Kunth: 263 (1837); Boeck.: 78 (1871–1873); C.B. Clarke: 638 (1894b); C.B. Clarke: 265 (1897/98). Type: Caput bonae spei; in silvis primaevis, Krakakammae, Alt. 1, Uitenhage, *Ecklon* (?). Figure 31C, D.

Vouchers: *F. Lennox s.n.*; *C.J. Ward 951*.

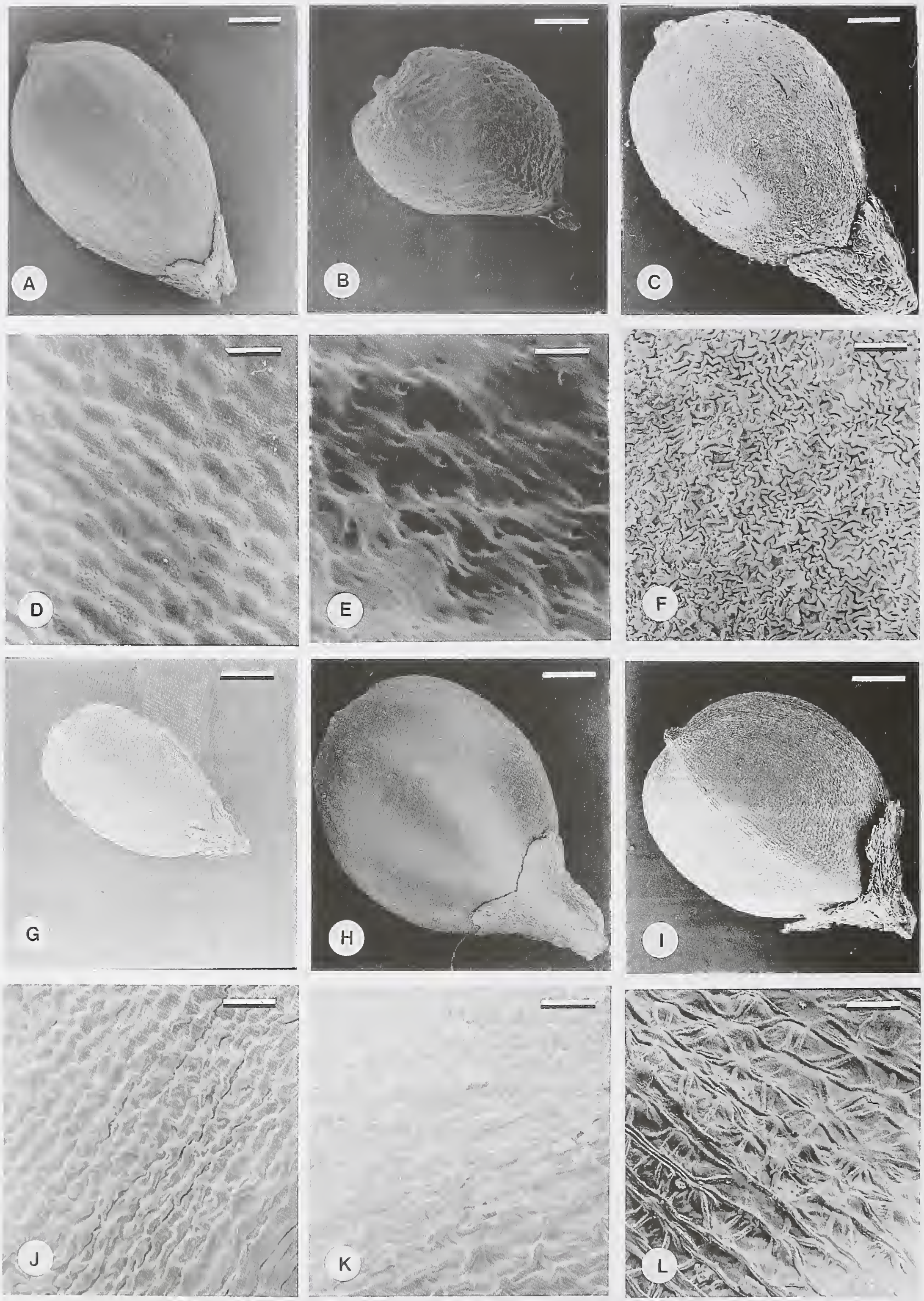

FIGURE 32.—*Ficinia*. A, D, *F. filiculmea*, *Hilliard & B.L. Burtt 15319*; B, E, *F. gracilis*, *Hilliard & B.L. Burtt 17546*; C, F, *F. laciniata*, *Frankish 185*; G, J, *F. nana*, *Hilliard & B.L. Burtt 14907*; H, K, *F. stolonifera*, *Killick 1062*; I, L, Species A, *Huntley 392*. Scale bars: A–C, G–I, 250 µm; D–F, J–L, 25 µm.

Distribution: Coastal hinterland (Noodsberg); southern Natal (Weza).

F. fascicularis has not previously been reported for Natal, except as an unidentified taxon [*Ficinia* sp. No. 5, Gordon-Gray: 108 (1972)]. The species is better known in the Transkei (*Hilliard & B.L. Burtt 18773; Stirton 5621B*, PRE), the eastern Cape (*Hilliard & B.L. Burtt 18863*, Amatola Mtns) and further westward to Knysna.

Plants perennial with thickened (2–3 mm wide), often uniseriate rhizome covered by overlapping brown to reddish brown scale leaves. Culms slender and flexuous (up to 2 m in length; main photsynthetic organs), bases clothed by successively longer reddish brown to reddish purple tubular sheaths with truncate mouths. Leaf blades poorly developed (hair-like, and inconspicuous when present), the uppermost of a shoot longest (20–120 mm). Inflorescences terminal (a small, much reduced panicle, ± 150 × ± 100 mm) of rather delicate, golden brown to blackish spikelets with minutely acuminate glumes. The lowest 1–2 spikelet groups are subtended by filiform bracts (± 250 mm long).

Favoured habitats are cliff bases, rock overhangs and crevices (sandstone in particular?) where moisture drips and insolation is somewhat reduced. The long culms either droop from a height, or lie trailing upon and intertwined with other vegetation, mostly grasses.

F. fascicularis shows some relationship with *F. filiculmea* (No. 4) in general appearance and some minutae of the floral organs, but the inflorescences are quite different. Further study of both species is required.

4. **Ficinia filiculmea** *B.L. Burtt* in Notes from the Royal Botanic Garden Edinburgh 43: 358 (1986); Hilliard: 56 (1987); Hilliard & B.L. Burtt: 114 (1987). Type: Natal, Underberg Dist., Upper Polela Cave area, ± 6800 ft., *Hilliard & B.L. Burtt 12564* (E, holo., NU, iso.). Figure 32A, D.

Vouchers: *Hilliard & B.L. Burtt 13446, 15053, 15319, 15519.*

Description: B.L. Burtt: 358 (1986) protologue.

Distribution: Uplands.

Plants perennial with a nodose, intertwined or uniseriate rhizome (± 2 mm in diameter) that closely resembles the same organ in *F. fascicularis*. There is similarity, too, in the slender culms clothed basally in brown, brownish red or bright purplish red sheaths each longer than its predecessor (coloration is more vivid in shaded habitats). Leaf blades are variable in development (up to ± 500 × ± 0.75 mm), but often much reduced (especially those of plants growing in rock crevices where insolation is lessened). On morphology of the vegetative organs alone, more attenuate plants of *F. filiculmea* may easily be mistaken for plants of *F. fascicularis* (No. 3). In the former species, however, growth habit is variable as Burtt (1986) reported plants with erect culms from the Sani Pass area of Lesotho. Inflorescences also differ: in *F. filiculmea* solitary spikelets often terminate the culms, or 1–4 (all sessile) may be aggregated into compact heads subtended by 2(–1) short bracts.

Burtt has related *F. filiculmea* to *F. acuminata* (Nees) Nees, a Cape species with almost black, shortly acuminate glumes. Both taxa, together with *F. elongata* Boeck. [not convincingly segregated from *F. acuminata*, see Levyns (1950)], *F. kunthiana* Boeck. and *F. fascicularis* should be studied further, especially in the field throughout their distributional ranges, in order to establish relationships with greater accuracy than pertains at present.

5. **Ficinia gracilis** *Schrad.*, Analecta ad floram capensem 1. Cyperaceae: 44 (1832b); Nees: 292 (1834b); Nees: 172 (1835); Kunth: 256 (1837); Boeck.: 68 (1871–1873); C.B. Clarke: 638 (1894b) non (Poir.) Schrad.; C.B. Clarke: 251 (1897/98) excl. some synonymy and specimen of *Thouars 17*; C.B. Clarke: 461 (1901/02); J. Raynal: 209 (1974); R.W. Haines & Lye: 133 (1983) non (Poir.) Schrad. Type: Cape Province, without precise locality, *Zeyher 32* (P, iso.). Figure 32B, E.

Melancranis gracilis (Schrad.) Kuntze: 756 (1891); *M. zeyheri* Kuntze: 756 (1891), name illegit.

Isolepis lineata Nees: 160 (1835), name illegit. non (Michx.) Roem. & Schult. (1817). Syntypes: Cape Province, *Ecklon s.n.* two specimens.

F. undosa B.L. Burtt: 360 (1986); Hilliard: 56 (1987); Hilliard & B.L. Burtt: 114 (1987). Type: Natal, Mpendhle Dist., Mulangane ridge above Carter's Nek, 7000–7300 ft., *Hilliard & B.L. Burtt 17551* (E, holo.; NU, iso.).

Icones: R.W. Haines & Lye: fig. 256 (1983). Note: the description states there are 3 style branches; only 2 are illustrated except in some florets of the spikelet (enlarged). All known Natal specimens have 3 style arms. The achene (enlarged) is not accurate for Natal examples.

Vouchers: *Killick 1383; Hilliard & B.L. Burtt 15428, 17546, 17682.*

Description: B.L. Burtt: 360 (1986) as *Ficinia undosa.*

Distribution: Coast (particularly southern), Uplands.

Raynal (1974) established the identity of *Scirpus gracilis* Poir. (type: *Du Petit-Thouars 17*) as a representative sample of *Ficinia ecklonea* (Steud.) Nees (= *Scirpus ecklonii* Steud.). *Ficinia gracilis* Schrad. (type: *Zeyher 32*) is quite distinct. Therefore inclusion of Poiret's name in the authorship of *F. gracilis* is incorrect, see Haines & Lye (1983); Reid (1985).

Burtt (1986) established *Ficinia undosa* for leaf-bearing stoloniferous perennials growing in the Natal Uplands (up to 2 100 m) in marshy ground at the edge of flat rock sheets and as a constituent of the moister parts of open grassland. To his species he referred *Killick 1383* that tentatively had been named *F. gracilis*. Killick's plant belongs with Burtt's species, but Burtt's type is in agreement with *Zeyher 32* (P). Therefore Burtt's species must be placed in synonymy under *F. gracilis* Schrad.

Most easily recognised by achenes which, at maturity, are small (1.2–1.5 × 0.8–1.3 mm including the almost obsolescent gynophore), obovate, obscurely trigonous, dark brown with a surface irregularly transversely ridged. However, many specimens lack mature fruits and other features must be used in attempting identification. Ovaries, because of their faint ridging, tend to reflect light and glisten slightly during dissection. Anther crests differ from those of the otherwise very similar *F. dasystachys* (in which species mature achenes are still unknown: see Key to species). The ligulate leaves are a convenient means of distinction from sp. A, No. 8 (young plants are easily confused with those of sp. A if the sheath mouth is not examined).

A further problem of relationship exists and requires investigation. Raynal (1974) pointed out that the name.

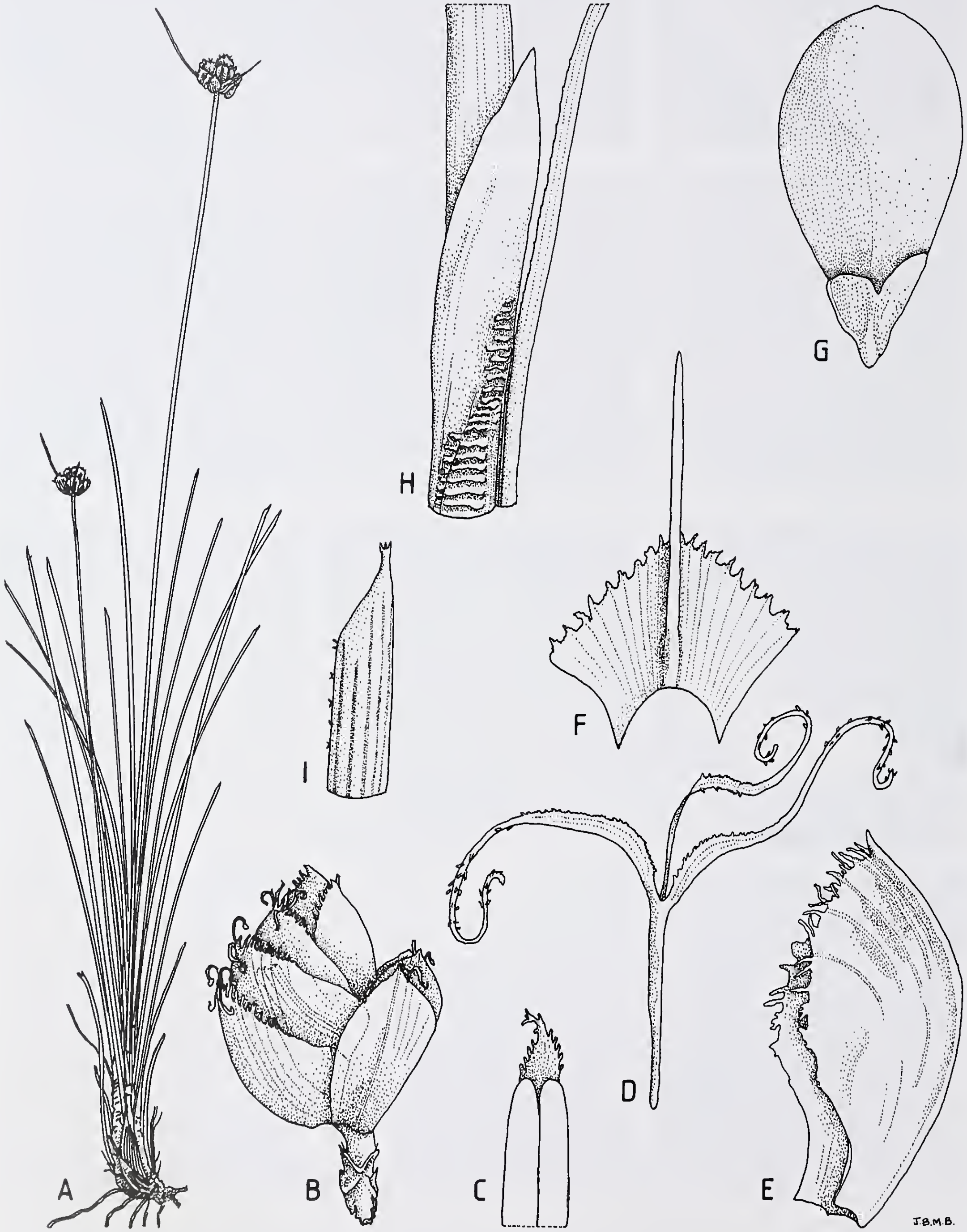

FIGURE 33.—*Ficinia laciniata.* A–F, H, I, *Pooley 1877*; G, *Ward 2793*. A, plant, × 1; B, two spikelets, × 11; C, anther crest, × 37; D, style and style branches, × 29; E, glume, lateral view, × 27; F, small bract, × 9; G, achene with gynophore, × 37; H, ligule, note transverse puckering of membranous tissue, × 12; I, apex of leaf lamina, × 33.

F. filiformis (Lam.) Schrad., had long been misapplied and must be adopted for the entity known as *F. tenuifolia* Kunth. Misapplication of *F. filiformis* has led to the incorporation of foreign elements within its limits (particularly some better placed with *F. stolonifera* Boeck.) so that, for many workers, the identity of *F. filiformis* (= *F. tenuifolia*) is unclear. In its strict sense this species has an achene similar to that of *F. gracilis*. Burtt (1986) drew attention to this and allied his *F. undosa* to *F. filiformis*. Cape plants of *F. filiformis* seem more slender than many Natal specimens of *F. gracilis* , and there may be differences in the glume apex; otherwise, as far as has been investigated, relationships are close. However, in Natal, there are slender specimens that are not readily differentiated from *F. gracilis* (*C.J. Ward 6649*, Port Edward; *Nicholson 611* (NH) Uvongo; *Goetghebeur 4501* (PRE) Mlambonja River, Drakensberg Gardens area). These are here included within *F. gracilis*, pending study of *F. filiformis* over its total distributional area. Burtt (1986) stated that Raynal considered *F. filiformis* to be restricted to a small area of the SW Cape; this seems unlikely.

Other Natal specimens, all of which lack mature achenes, are tentatively referred to *F. gracilis* pending further investigation (*C.J. Ward 5068*, Dukuduku; *M.C. Ward 1925*, Amatikulu; *Tomlinson 2/51*, Nyalazi, NH; *Ngwenya 328*, Durban, NH). These, if their identity is confirmed by field study in the areas named, will aid in establishing accurate distributional limits for *F. gracilis* in Natal.

6. **Ficinia laciniata** *(Thunb.) Nees* in Linnaea 9: 292 (1834b) nom. nud.; Nees 10: 177 (1835) description; Kunth: 259 (1837); Boeck.: 73 (1871–1873); C.B. Clarke: 639 (1894b); C.B. Clarke: 248 (1897/98). Type: Cap. b. spei., *Thunberg* (C?). Figures 32C, F; 33.

Scirpus laciniatus Thunb.: 17 (1794); Thunb.: 97 (1807).

Vouchers: *Killick 648; Pooley 1877; C.J. Ward 945, 1483, 2790, 2793, 5033.*

Description: C.B. Clarke: 248 (1897/98).

Distribution: Coast.

The most easily recognised of the Natal species. Plants sparsely tufted, erect perennials known only from coast and coastal hinterland (Inchanga the furthest inland locality recorded), growing in sand in association with grasses where conditions may sometimes be damper than surrounding locale. Identified easily by ragged margin of glume; stocking-like, tubular yellowish membranous ligule that shows marked transverse wrinkles as it ages (it breaks down with more extreme age); and pointed apex of leaf blade. Achene, at maturity, has a well-marked gynophore that forms a podium. Surface of achene unusually strongly wrinkled under electron scanning (Figure 32F) and probably merits further investigation. Inflorescence (a head of spikelets) often shows indisputable evidence of its compound composition as different levels of attachment of bracts and groups of spikelets can frequently be observed. *F. laciniata* is not closely allied to any other Natal species of the genus.

7. **Ficinia stolonifera** *Boeck.* in Linnaea 37: 60 (1871–1873); C.B. Clarke: 643 (1894b); C.B. Clarke: 243 (1897/98); Schönland: 45 (1922); J. Raynal: 211 (1974); Hilliard: 56 (1987); Hilliard & B.L. Burtt: 114 (1987). Type: South Africa, without precise locality, *Ecklon & Zeyher 141*. Figure 32H, K.

Melancranis contorta Kuntze: 756 (1891) name illegit. (the type of *F. stolonifera* Boeck. included); *F. contorta* (Kuntze) Pfeifer: 19 (1921) combination illegit. *F. filiformis* (Lam.) Schrad. var. *contorta* Nees: 173 (1835).

Scirpus leucocoleus K. Schum.: 125 (1895). Type: Locality unknown, *Volkens 1858* (G, iso.).

F. filiformis auctt. non (Lam.) Schrad.: C.B. Clarke: 460 (1901/02); Kük.: 398 (1936/1937); Napper: 1 (1965).

Vouchers: *Edwards 2376; Hilliard & B.L. Burtt 11801, 15441, 17661, 17774; Killick 711, 1062; C.J. Ward 1483.*

Distribution: Coast, Midlands, Uplands, N Natal, Kokstad (probably widespread).

Probably the most widely distributed and the most frequently encountered of the Natal species. Unfortunately, there has been confusion with other names, *F. filiformis* non (Lam.) Schrad. in particular, being misapplied to small plants and those lacking stolons. *F. filiformis* has now been more clearly defined (Raynal 1974; Burtt 1986) and has an achene with transverse undulations, quite different from the achene of *F. stolonifera* (Figure 32). Note: Haines' & Lye's (1983) description and figure of *F. filiformis* almost certainly apply to *F. stolonifera* Boeck.

In Natal, plants are common components of sparse, dry grassland in coarse gravel, often along roadsides where some disturbance has occurred, or in damper, more lush grasslands: the better the growing conditions, the more robust the plants, but *F. stolonifera* is never large. Tufts are relatively slender, their height probably never exceeding 0.5 m (generally 300–400 mm), depending upon the height of surrounding vegetation.

Ficinia stolonifera is best identified by its ligule, a tubular delicate shining white (sometimes yellowish) membrane that is not always easily observed intact (Figure 30D). Breaks readily into fragments that surround shoot at mouth of leaf sheaths, but these fragments persist and can usually be seen. Inflorescence is also characteristic, consisting of a head of 8–1 sessile spikelets that radiate and are easily counted (spikelet numbers within inflorescences vary on individual plants, almost always including examples of 2 or 1 only). Glume obtuse, with membranous margin and a mid-nerve that terminates below apex. Mature achene elliptic to oblong in outline, smooth-surfaced, dark blackish grey with a well-developed, lobed gynophore.

Burtt (1986) described *F. nana* as distinct from *F. stolonifera* by its small size, curved bases of the culms and solitary spikelets. He believed its consistent size and habit over a wide area (Giant's Castle to Bushman's Nek) marked it off; but its spikelets and achenes differed hardly at all from *F. stolonifera*. Work during the present study suggests intermediates link these species, if indeed they are distinct, and that, if *F. nana* is to be recognised, infraspecific ranking is more justifiable. However, further

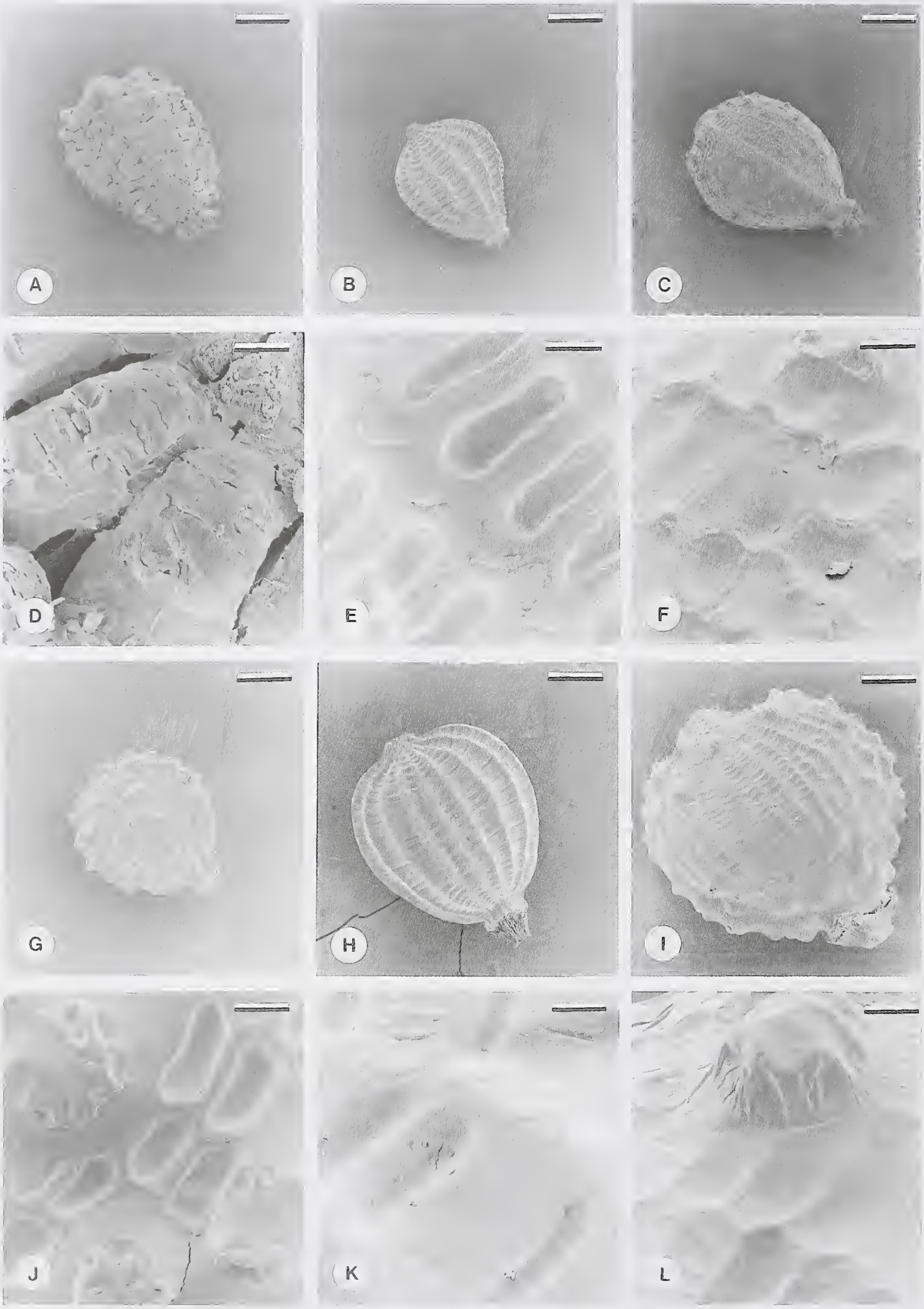

FIGURE 34.—*Fimbristylis*. A, D, *F. aphylla*, *Ward 7481*; B, E, *F. bisumbellata*, *Tinley 840* ; C, F, *F. complanata*, *Ward 3482*; G, J, *F. complanata*, *J. Browning 168*; H, K, *F. dichotoma*, *K.D. Gordon-Gray 6015* ; I, L, *F. dregeana*, *Ward 10183*. Scale bars: A–C, G–I, 250 µm; D–E, J–L, 25 µm.

study is needed and pending this, Burtt's species is included within the limits of *F. stolonifera.*

8. **Ficinia** sp. A

The citation of *Buchanan 71* (K) by Clarke (1897/98) as *Ficinia cinnamomea* C.B. Clarke has led in the past to the inclusion within that species of the entity recognised here as *F.* sp. A and briefly described below.

Perennial, densely tufted. Rhizome abbreviated, elongate stolons never developed. Culms numerous, slender, becoming yellowish and outward-bending at maturity of inflorescence; shoots clothed basally in crowded, persistent, dark brown leaf sheaths. Leaves numerous; sheaths tubular, mouths sloping downwards, inwards to leaf blade; eligulate; blades fine, wiry, scabrid, mostly shorter than culms, inconspicuous, channelled. Inflorescence a hemispherical head, lateral when young (overtopping bract continuing in line of culm) becoming terminal; main bract 30–60 mm, leaf-like. Spikelets closely packed. Glumes boat-shaped, elliptic in profile, dark brown; flanks with numerous greenish yellow to pallid lateral veins; keel greenish yellow to pallid, excurrent into a short, sometimes recurved apiculum (not always developed in young glumes). Stamens 3; anther crest linear with numerous microscopic projections. Ovary trigonous; style branches 3. Achene 1.5–2.3 (including gynophore) × 1.1–1.5 mm, bluntly 3-angled, apex minutely projecting, dark brownish black faintly overlaid greyish white (the outermost pericarp cells lift and peel away), surface appearing smooth (small cells detectable under high magnification); gynophore 0.5–0.6 mm deep, creamy yellow, 3-lobed, lobes smooth-margined or coarsely dentate, appearing to fit over base of achene rather than to form a supporting podium. Figure 32I, L.

Vouchers: *Edwards 335, 2221; Galpin in PRE 38950; Hilliard & B.L. Burtt 15295, 17552; K.D. Huntley 392; Killick 941; McAllister 75* (PRE); *Moll 1445.*

Distribution: Midlands, Uplands, Zululand (Qudeni).

Species A cannot now be named as it has not yet been compared with all described taxa. Diagnostic features are absence of a ligule (sheath mouth sloping downwards, inwards to leaf blade: unusual for Natal species (Figure 30A1, A2), and the growth habit (plants tufted, lacking stolons, with well-developed dark brown, persistent leaf bases; culms yellowish at maturity of spikelets, slender, often scabrid, outwardly curving to give graceful, conspicuous form to tuft; sometimes lodging on substrate). Mature achenes are also useful. These are not unlike those of *F. cinnamomea* (with which species the present entity has been much confused), but larger (1.5–2.3 × 1.1–1.3 mm in sp. A; 1.1–1.5 × 0.8–0.95 mm in *F. cinnamomea*; lengths including gynophore) and with the gynophore tending to ensheath the base of the achene in sp. A, but to form a podium to it in *F. cinnamomea* (Figures 31A, B; 32I, L). Like the glumes of *F. cinnamomea*, those of species A are often acuminate, but the apicula in the latter are shorter, darker and less markedly outwardly curving than in *F. cinnamomea.*

Before maturity of the inflorescence and on superficial inspection, species A may be readily confused with *F. cinnamomea* (No. 1), *F. dasystachys* (No. 2), and *F. gracilis* (No. 5), but its eligulate leaf sheath sets it apart from these taxa.

0471000 FIMBRISTYLIS

Fimbristylis *Vahl*, Enumeratio plantarum 2: 285 (1805) nom. conserv.; Nees: 289 (1834b); Kunth: 221 (1837); Steud.: 106 (1855); C.B. Clarke: 199 (1897/98); C.B. Clarke: 411 (1901/02); Schönland: 33 (1922); Gordon-Gray: 79 (1959); Podlech: 21 (1967); R.A. Dyer: 884 (1976); R.W. Haines & Lye: 77 (1983); Goetgh. & Coudijzer: 75 (1984). Type species: *F. dichotoma* (L.) Vahl, type conserved.

Note: *Fimbristylis* Vahl has an extensive synonymy not included here [Gordon-Gray: 79 (1959)]. The genus is closely related to *Bulbostylis* and to *Abildgaardia*, species of which often previously have been included within the limits of *Fimbristylis.* In this work the three genera are treated separately. (For *Fimbristylis hispidula* (Vahl) Kunth see *Bulbostylis hispidula* (Vahl) R.W. Haines).

1. **Fimbristylis aphylla** *Steud.*, Synopsis plantarum glumacearum 2 Cyperaceae: 114 (1855); Kern: 117 (1955); Gordon-Gray: 188 (1959); Kern: 552 (1974); Goetgh. & Coudijzer: 83 (1984). Syntypes: Herbarium Goering, Sect. II, No. 149; *Herbarium Zollinger 1609, 3524.* Java, in paludibus prope Prabakti, 2 000 ft., (P). Figure 34A, D.

F. globulosa (Retz.) Kunth var. *aphylla* (Steud.) Miq.: 322 (1855).

F. tristachya Nees ex Kunth: 235 (1837) non R. Br. (1810).

F. vanderystii De Wild.: 205 (1927). Type: Belgian Congo (Zaïre), Kisantu, Lazaret du Sacre Coeur, *Vanderyst s.n.* (BRUX).

F. testui Cherm.: 33 (1931). *F. quinquangularis* sensu C.B. Clarke: 421 (1901/02) p.p. at least *Scott Elliot 5166* (K). *F. quinquangularis* C.B. Clarke var. *testui* (Cherm.) Robyns & Tournay: 262 (1955). Syntypes: Congo, Oubangui, *Tisserant 1523, 2269, (2769 ?)*; *Le Testu s.n.* (1921).

Vouchers: *K.D. Gordon-Gray 4493; C.J. Ward 2849, 2929, 7228, 7481.*

Description: Gordon-Gray: 188 (1959); Kern: 552 (1974).

Distribution: Coast, Maputaland.

Tufted perennial with erect, 4–5-angled culms; leaves reduced to sheaths; inflorescence a compound anthela with 2–5 bracts that do not exceed inflorescence length. Achenes tuberculate (warted). In Natal, plants occupy permanently wet vleis in coastal situations from Maputaland to Port Shepstone. The preferred microhabitat is, perhaps, most accurately defined as isolated relict areas of swamp forest (often very small in dimension). One plant of *Ward 2849* shows an elongate stolon, but the majority of herbarium specimens give no evidence of underground reproductive organs. The species is present in tropical Africa, India and Asia. It is a component of the difficult section *Miliaceae* (Ohwi 1938: 572) to which *F. littoralis* Gaud. and *F. miliacea* (L.) Vahl belong. Its angled culms and tuberculate achenes set it apart from all other Natal species.

Key to species

1a Style base bearing many or few, long, white pendant hairs that form a fringe over the achene .... 9. *F. squarrosa*
1b Style base lacking long, white, pendant hairs that form a fringe over the achene 2

2a Style branches 2 in number 3
2b Style branches 3 in number 7

3a Achene surface longitudinally ridged, trabeculate and cancellate (latticed). Leaf blades developed 4
3b Achene surface reticulate or smooth (if faintly longitudinally ridged and cancellate, then leaf blades reduced to apiculi terminating the sheaths) 6

4a Spikelets 1.2–1.6 mm broad, angled by projecting glume keels; rachilla naked, lacking wings of persistent tissue. Style about 0.08 mm wide at narrowest point (never attaining 0.1 mm) .... 2. *F. bisumbellata*
4b Spikelets broader than 2 mm, scarcely angled by projecting glume keels; rachilla ragged with wings of persistent tissue. Style wider than 0.15 mm at narrowest point 5

5a Achenes etuberculate .... 4. *F. dichotoma*
5b Achenes tuberculate .... 5. *F. dregeana*

6a Glumes grey-pubescent abaxially in distal half. Achenes etuberculate, obovate to orbicular with clearly developed gynophore; surface reticulate to smooth (epidermal pericarp cells hexagonal). Culms not spongy and coarse, never with transverse septa visible .... 6. *F. ferruginea* (including *F. sieberiana*)
6b Glumes glabrous or sometimes sparsely grey-pubescent abaxially in distal half. Achenes usually tuberculate, especially near ridges, occasionally etuberculate, obovate with poorly developed gynophore; achene surface reticulate, smooth, or faintly longitudinally ridged and cancellate (epidermal pericarp cells hexagonal to rectangular, broader than long (deep). Culms spongy and coarse sometimes with transverse septa visible .... 7. *F. longiculmis*

7a Plants with leaf blades well-developed, rigid, succulent, glabrous radiating from the shoot apex .... 8. *F. obtusifolia*
7b Plants with leaf blades reduced to apiculi (sometimes in *F. complanata* the blade to the uppermost sheath of a shoot may be elongate or leaf blades may be well developed, but then never radiating round the culms) 8

8a Leaves with a ligule (a dense fringe of white hairs; even leaves with the laminas reduced develop such ligules). Spikelet rachilla winged except at extreme base. Rhizome well developed, usually clearly sympodial 3. *F. complanata* (including *F. consanguinea*)
8b Leaves eligulate. Spikelet rachilla hardly winged. Plants tufted, the rhizome usually evident only when tufts broken apart (very occasionally an elongate rhizome may be developed in *F. aphylla*, but this not clearly sympodial and uniseriate) 9

9a Inflorescence an anthela, the branches clearly defined. Culms markedly 4-, occasionally 5-angled, spongy .... 1. *F. aphylla*
9b Inflorescence usually a single head of 2–9 sessile spikelets (occasionally 2 or more spikelets slightly pedicelled, or heads reduced to a solitary spikelet on the same plant). Culm terete, or slightly flattened immediately beneath inflorescence, never markedly 4- or 5-angled, not obviously spongy .... 10. *F. variegata*

2. **Fimbristylis bisumbellata** *(Forssk.) Bubani* in Dodecanthea: 30 (1850); Nelmes & Baldwin: 377 (1952); Gordon-Gray: 377 (1968); R.W. Haines & Lye: 86 (1983). Type: Egypt, 'In locis litoreis in undatis insularum Niloticarum', *Forsskål s.n.* (BM). Figure 34B, E.

Scirpus bisumbellatus Forssk.: 15 (1775). *F. dichotoma* (L.) Vahl: 287 (1805) p.p. excluding basionym; Kunth: 225 (1837) p.p.; A. Rich.: 504 (1851); Boeck.: 12 (1871–1873); C.B. Clarke: 602 (1894b); C.B. Clarke: 200 (1897/98); C.B. Clarke: 414 (1901/02).

Icones: Gordon-Gray: figs 9, 14 (1968); R.W. Haines & Lye: figs 141, 142 (1983); Vanden Berghen: fig. 177 (1988).

Vouchers: *Tinley 529, 840; C.J. Ward 3152; C.J. Ward & F.L. Farquharson 10030.*

Description: Gordon-Gray: 377 (1968).

Distribution: Maputaland.

In Natal known only from Maputaland (particularly Ndumu) where short (hardly exceeding 300 mm), tufted, leafy annual plants occupy exposed bare, alluvial loamy–sandy soil marginal to streamlets and pans. In general facies plants resemble those of *F. squarrosa* (No. 9), which species is known only from Richard's Bay where plants are early colonizers of mud flats. Distinction is simple as the style bases of *F. bisumbellata* lack the hairs that depend over the achenes of *F. squarrosa.*

In Natal distinction between *F. bisumbellata* and *F. dichotoma* (No. 4) is also straightforward because spikelets are polygonal (angled), 1.2–1.6 mm wide, with a wingless rachilla in the former; rounded, 2.0–3.0 mm wide with a winged rachilla in the latter. The achenes also differ in size and in the number of rows of cells to each face (Figure 34B, H). *F. bisumbellata* is essentially tropical (Africa, India, Malaysia to Australia). In these warmer climates, plants are frequently sympatric with those of *F. dichotoma*. Hybridisation is not uncommon with intermediates blurring the specific limits. Attention is drawn to the synonymy of both species since the name *F. dichotoma* (L.) Vahl has been applied to both entities during their histories.

3. **Fimbristylis complanata** *(Retz.) Link* in Hortus regius botanicus berolinensis descriptus 1: 292 (1827); Kunth: 288 (1837); A. Rich.: 505 (1851); Ridl.: 150 (1884); C.B. Clarke: 602 (1894b); C.B. Clarke: 202 (1897/98); C.B. Clarke: 422 (1901/02); Gordon-Gray: 155 (1959); Frankish: 3 (1960); R.W. Haines & Lye: 78 (1983); Goetgh. & Coudijzer: 82 (1984). Type: India, *Koenig s.n.* (C, LD). Figure 34C, F, G, J.

Scirpus complanatus Retz.: 14 (1788). *Trichelostylis complanata* (Retz.) Nees: 290 (1834b) nom. nud.; Nees: 146 (1835).

F. consanguinea Kunth: 228 (1837); Steud.: 113 (1855); Kern: 110 (1955). *F. complanata* var. *consanguinea* (Kunth) C.B. Clarke: 602 (1894b); C.B. Clarke: 202 (1897/98). Syntypes: Cape Province, *Drège 4414, 4418, 7404.*

F. kraussiana Hochst. : 757 (1845) as a synonym, name invalid. *F. complanata* var. *kraussiana* (Hochst.) C.B. Clarke: 602 (1894b); C.B. Clarke: 202 (1897/98).

F. bequaertii De Wild.: 200 (1927). Type: Belgian Congo (Zaïre) Kibimbi, *Bequaert 126.*

Icones: Frankish: fig. 1 (1960); R.W. Haines & Lye: figs 119, 120 (1983); Goetgh. & Coudijzer: fig. 1B (1984).

Vouchers: *J. Browning 168; Edwards 1043, 2353, 2400; Frankish 211, 212, 214, 261; K.D. Huntley 707 755; C.J. Ward 1310, 2545, 3482.*

Description: Gordon-Gray: 155 (1959).

Distribution: widespread, least frequent in Uplands, up to ± 1 500 m.

Amongst the commonest of Natal sedges, particularly frequent in coastal grassveld, where, in damper parts, it may be locally dominant. Poorly grown plants often a component of low turf, covering and overhanging rocks close to sea. Inland, *F. complanata* intermingles with other water-loving plants, fringes vleis and pans where water is permanent, or occupies small damp depressions in grassveld. Plants very variable in robustness, degree of development of leaf blades, flattening and twisting, or not, of culms, degree of branching and clustering, or not, of spikelets within inflorescence, and tuberculation (warting), or not, of achenes. Extremes may occur in very close association within a microhabitat (represented for example, in the several sheets of *Huntley 755* and again in the several sheets of *Frankish 261*). Constant characters that permit reliable identification: ligule a dense fringe of short white hairs at mouth of sheath across base of leaf blade, even when blade is reduced; spikelet rachilla that is winged and ragged, except at extreme base. It should be noted that Kern (1955, 1974), for Malesia, maintained *F. consanguinea* as distinct (an entity of high altitudes, 1 600–2 300 m) from *F. complanata* (0–1 300 m). The morphological differences he recognised (reduced dimensions for culms, leaves and inflorescence branching and greater sizes of glumes, styles, achenes within *F. consanguinea*) certainly do not correlate with the characteristics of plants from high altitudes in Natal. Koyama (1985), for Ceylon, also segregated *F. consanguinea* from *F. complanata*. This author relied upon the leaf sheaths as the only means of distinction (leaf sheath cylindrical with rounded back in *F. consanguinea*; sheaths 2-ranked, folded with an acute keel on the back in *F. complanata*). This criterion does not effectively distinguish two species amongst Natal plants and only *F. complanata* is recognised for that geographical area. A world survey of both taxa might be revealing.

4. **Fimbristylis dichotoma** *(L.) Vahl* in Enumeratio plantarum 2: 287 (1805); Kern: 155, 160 (1955); Podlech: 23 (1967); Gordon-Gray: 371 (1968); R.W. Haines & Lye: 85 (1983); Goetgh. & Coudijzer: 77 (1984). Syntypes: Ceylon, Hb. Hermann 2. fol. 63 (BM); '*Gramen Cyperoides, Maderas-patanum, Juncelli Gesneris..*', Pluk. Alm.: 179, t, f. 3 (1705) (BM). Figure 34H, K.

Scirpus dichotomus L.: 50 (1753); L.: 74 (1762).

S. diphyllus Retz.: 15 (1788). *F. diphylla* (Retz.) Vahl: 289 (1805); C.B. Clarke: 603 (1894b); C.B. Clarke: 200 (1897/98); C.B. Clarke: 417 (1901/02); Schönland: 33 (1922); De Wild.: 201 (1927). Type: India orientalis, Tranquebar, *Koenig s.n.*

F. laxa Vahl: 292 (1805); *F. dichotoma* (L.) Vahl var. *laxa* (Vahl) Napper: 436 (1971b).

Icones: C.B. Clarke: t. 42, figs 1, 2 (1909); Schönland: t. 27 (1922) as *F. diphylla*; Gordon-Gray: figs 8, 14 (1968); R.W. Haines & Lye: figs 139, 140 (1983); Goetgh. & Coudijzer: fig. 2A (1984) achene only: Vanden Berghen: figs 180, 181 (1988).

Vouchers: *K.D. Gordon-Gray 6015; K.D. Huntley 502; Killick 2323, 2343; C.J.Ward 751, 673, 1678, 2919, 4011.*

Description: Gordon-Gray: 373 (1968).

Distribution: widespread, least common in Uplands.

Present in tropical and warm temperate regions throughout the world. In Natal, plants occur wherever there is fresh water, from near sea level to 1 800 m on the Drakensberg. Usually scattered among other sedges and grasses and seldom dominate vegetation. Also ruderals and weeds. Growth duration generally accepted as perennial, but short-lived rather than long persistent. In unfavourable habitats plants may be annual and depauperate with the usually twice compound anthela reduced to a few spikelets clustered into a head, or to a solitary spikelet (unusual). Vegetative organs and culms generally glabrous, but leaf sheaths densely hairy on a specimen from Elandslaagte near Ladysmith. Easily identified by dark brown glabrous glumes; smoothly rounded (not angled) spikelets; biconvex achenes with surface trabeculate (cancellate) with 6–9 longitudinal ridges and numerous crossbars between ridges. There should be no confusion with *F. bisumbellata* which has similarly marked but much smaller achenes with 5–8 longitudinal ridges and other more significant differences (see key), nor with *F. ferruginea* where glumes are greyish white pubescent distally and achenes smooth-surfaced.

In the strict sense, achenes of *F. dichotoma* in Natal are etuberculate. Occasional plants produce tuberculate achenes. These are generally coastal and seem most commonly represented in the south (Port Shepstone to Port Edward, particularly the Oribi Gorge area). Assessment of these specimens suggests they may be sporadic hybrids or products of backcrossing following upon initial hybridisation with an unidentified relative, but this hypothetical interpretation needs investigation, (No. 5 and Hybrid catalogue, p. 206).

Wherever in the world *F. dichotoma* occurs it is variable. Many subspecies and varieties have been established. None are recognised for the geographical area of Natal.

5. **Fimbristylis dregeana** *Kunth*, Enumeratio plantarum 2: 232 (1837). Type: Transkei/Natal, from between Umtentu and Umsimkulu Rivers, *Drège s.n.* (K, holo.). Figure 34I, L.

Icones: Gordon-Gray: fig. 13 (1968).

Voucher: *C.J. Ward 10183.*

Description: see Hybrid catalogue p. 206.

Distribution: Coast (southern Natal).

This entity is of considerable interest. Kunth's founding of the species dates back 150 years. Clarke (1897/98) placed it as a synonym of (*F. diphylla*) = *F. dichotoma* with the comment '*F. dregeana* Kunth is 3–4 in. only, but has much stouter rounder spikelets than *F. dichotoma*.' Gordon-Gray (1968) considered the type to be a

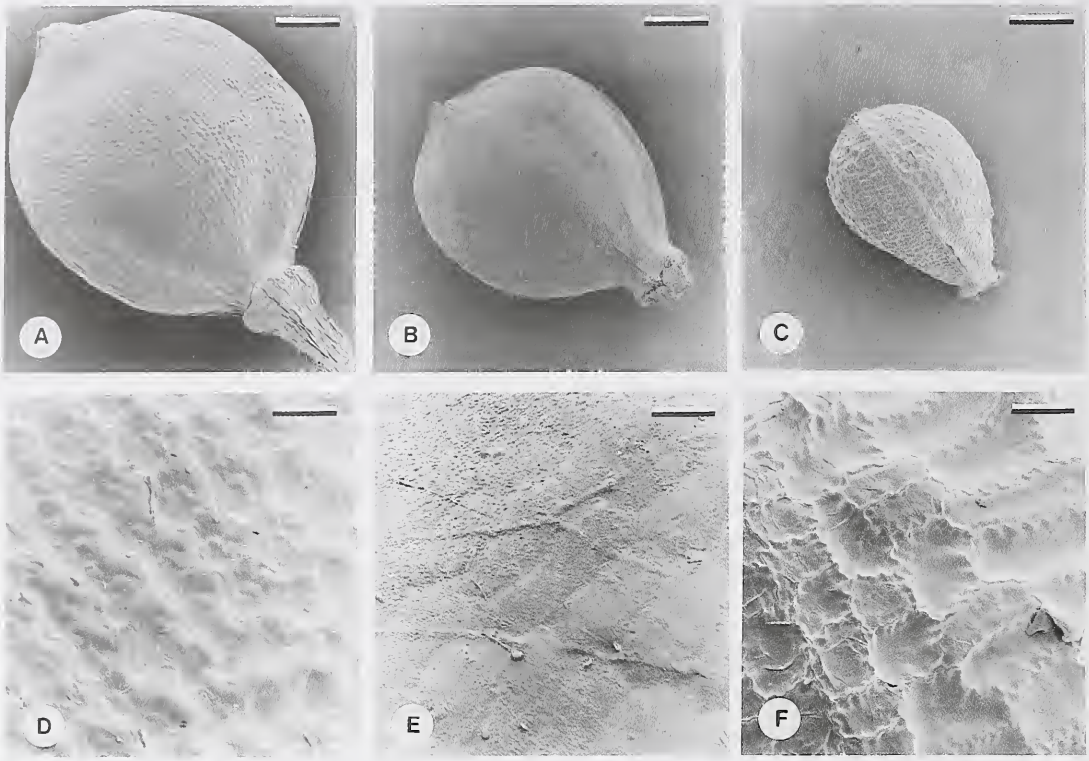

FIGURE 35.—*Fimbristylis*. A, D, *F. ferruginea*, *MacDonald 441a*; B, E, *F. longiculmis*, *Bayer & Henkel s.n.*; C, F, *F. obtusifolia*, *Ward 9079*. Scale bars: A–C, 250 µm; D–F, 25 µm.

sporadic putative hybrid between *F. dichotoma* and *F. ferruginea* as it did not appear to have been matched, nor re-collected, since Drège's original gathering. In the Oribi Gorge area other collections that appear likely hybrids between the same putative parents have more recently been made (*I'Ons 30/81, 38/81*), but these do not match Drège's type. All have tuberculate achenes, but Drège's type has the sturdy (approaching succulent) general facies of *F. ferruginea*, whereas the I'Ons plants are nearer typical *F. dichotoma*. C.J. Ward, engaged on ecological study between Margate and Port Edward in 1988, came upon a population of *Fimbristylis* plants growing 'with short hygrophilous herbs in organically much enriched moist sandy soil on granite; near seashore; subject to onshore salt-spray-bearing winds. Locally very common.' These plants possess the short stature, the inflorescence of few (1–6, usually 2 or 3) broad spikelets and the achenes of Drège's type. Indeed they must be considered conspecific. With this finding, it must be accepted (at least tentatively) that *F. dregeana* is a stabilized species that has probably existed for 150 years or longer. The extent of its distribution is not yet known, but it may well occur along the Transkeian coast to the Mtentu River. Further study is in progress.

Two possibilities need investigation. Firstly, that *F. dregeana* represents a stabilized hybrid species having its origin as the result of genetic interchange between the putative parents *F. dichotoma* and *F. ferruginea*, both of which co-exist with the stabilized progeny in the same general locality. Secondly, that *F. dregeana* represents ecotypic variation from *F. dichotoma* in response to growth upon a granitic substrate under conditions of exposure to salt-spray-bearing winds. This second alternative seems the less likely in view of the differences in achene structure in *F. dichotoma* (the presence of tubercles; the greater number, approx. × 2 of longitudinal ridges to each achene face; the smaller size of the cells comprising the outermost layer of the pericarp), as well as the lack of records of any other comparable ecotypes from localities where similar microhabitat conditions may exist.

Using the key provided in this work for the identification of *Fimbristylis* species, sporadic putative hybrids between *F. dichotoma* and *F. ferruginea* will work out to *F. dregeana* as most of these have tuberculate (warted) achenes. For further information see Hybrid Catalogue p. ??).

6. **Fimbristylis ferruginea** *(L.) Vahl*, Enumeratio plantarum 2: 291 (1805); Kunth: 236 (1837); Boeck.: 16 (1871–1873); Ridl.: 149 (1884); C.B. Clarke: 606 (1894b); C.B. Clarke: 201 (1897/98); C.B. Clarke: 417 (1901/02); De Wild.: 206 (1927); Nelmes & Baldwin: 375 (1952); Mogg: 141 (1958); Podlech: 24 (1967); Gordon-Gray: 384 (1968); Goetgh. & Coudijzer: 80 (1984). Type: 'in Jamaica paludibus maritimis', coll. unknown (LINN, holo.). Figure 35A, D.

Scirpus ferrugineus L.: 50 (1753); L.: 74 (1762). *F. tristachya* R. Br.: 227 (1810) non Kunth. *F. ferruginea* (L.) Vahl subsp. *ferruginea* R.W. Haines & Lye: 83 (1983).

F. sieberiana Kunth: 237 (1837); Steud.: 118 (1855); Kern: 131 (1955). *F. ferruginea* (L.) Vahl subsp. *sieberiana* (Kunth) Lye: 335 (1982b). Type: Mauritius, *Sieber 201*.

Icones: C.B. Clarke: t. 42, figs 9, 10 (1909); Gordon-Gray: figs 11, 14 (1968); R.W. Haines & Lye: figs 133–136 (1983); Vanden Berghen: fig. 182 (1988).

Vouchers: *Acocks 9980, 10012; Edwards 1726; K.D. Gordon-Gray 4762; McDonald 441a; C.J. Ward 4351, 4791, 8193, 8683; C.J. Ward & M.C. Ward 63.*

Description: Gordon-Gray: 385 (1968).

Distribution: Coast, Midlands, N Natal, Zululand, Maputaland.

Pantropical and very closely related to *F. sieberiana* Kunth which some authorities regard as synonymous. Differences are mainly of degree (wider spikelets and glumes and a more expanded inflorescence in *F. sieberiana*). Kern (1974), stated (*F. sieberiana* is) ‘Probably less halophilous than *F. ferruginea*’. The differences between these species seem to vary from one part of the distributional range to another. For example in Africa, Goetghebeur & Coudijzer (1984) made no mention of *F. sieberiana* in their treatment of *Fimbristylis* in Central Africa and included only *F. ferruginea*. Haines & Lye (1983), for East Africa, accorded *F. sieberiana* subspecific status. Podlech, for SWA (Namibia), followed Kern in the criteria used to maintain both species.

The majority of Natal plants (from moist coastal habitats) probably agree more precisely with characters and dimensions of *F. sieberiana* than with those of *F. ferruginea*, but many examples are difficult to place except arbitrarily, and there appear to be size gradients even within individual clones. Gatherings from sandy alluvial riverine situations well into the Midlands and N Natal (Colenso, Rorke’s Drift, Louwsburg) and others from Maputaland, often fit better with *F. ferruginea*. To attempt to differentiate these two species, even at infraspecific level, seems most artificial and so only *F. ferruginea* (in which *F. sieberiana* is included) is recognised for Natal. For criteria on which Kern (1955, 1974) based the differentiation of *F. sieberiana* from *F. ferruginea*, see Gordon-Gray: 395 (1968).

F. ferruginea is distinguished from *F. dichotoma* (No. 4) and *F. bisumbellata* (No. 2) by the smooth-surfaced achenes, round in outline, and by the glumes that are grey-velutinous abaxially in the distal half. Distinctions from *F. longiculmis* (No. 7) are less obvious. Collectively plants of *F. longiculmis* are taller with coarse terete culms, reduced leaf blades and inflorescence bracts, and achenes that are often (but not always) tuberculate.

Plants of *F. ferruginea* are generally short-lived perennials occupying wet, fresh to slightly saline habitats along coast and up rivers to well inland. Quite frequently plants of *F. dichotoma* and *F. ferruginea* grow intimately mixed. Ward (1980) noted that *F. ferruginea* may be an important associate of *Stenotaphrum secundatum* (Walt.) Kuntze in the ecotone between true halophytes and mesic grasses.

7. **Fimbristylis longiculmis** *Steud.*, Synopsis plantarum glumacearum 2: 110 (1855); C.B. Clarke: 607 (1894b); C.B. Clarke: 417 (1901/02); Gordon-Gray: 389 (1968); R.W. Haines & Lye: 82 (1983); Goetgh. & Coudijzer: 78 (1984). Type: Madagascar, Sainte Marie, *Boivin 1657* (P). Figure 35B, E.

F. sanzibarensis Boeck.: 437 (1880).

Icones: Gordon-Gray: fig. 12 (1968); R.W. Haines & Lye: fig. 132 (1983).

Vouchers: *Feeley & Ward 16; Moll 4780; Pooley 1966; R.H. Taylor 130; C.J. Ward 6803, 9049.*

Description: Gordon-Gray: 389 (1968).

Distribution: Maputaland.

F. longiculmis is represented in Natal by plants that are taller and more robust than those of *F. ferruginea*. Culms coarse and spongy, generally with transverse septa that become faintly visible externally after drying out. In the young state they may be compressed and 2-angled (later below the inflorescence only). Leaves reduced to sheaths. Floristically the two taxa are very close, but no specimens with grey-pubescent glumes are known (are these always interpreted as *F. ferruginea*?). Achenes variable in their surface sculpturing (smooth to faintly trabeculate) and in the presence or not, of tubercles (variable within a single plant). The morphology suggests *F. longiculmis* may have originated by hybridisation and backcrossing between *F. ferruginea* and another unidentified parent (*F. aphylla* perhaps?).

Plants are tufted perennials with a more or less vertical, compact rhizome, growing in permanent shallow water in seepage zones where substrate is organically enriched sand.

8. **Fimbristylis obtusifolia** *(Lam.) Kunth* in Enumeratio plantarum 2: 240 (1837); C.B. Clarke: 608 (1894b); C.B. Clarke: 203 (1897/98); C.B. Clarke: 423 (1901/02); Nelmes & Baldwin: 377 (1952); Gordon-Gray: 180 (1959). Figures 35C, F; 36.

Scirpus obtusifolius Lam.: 141 (1791); Schumach.: 30 (1827). *Isolepis obtusifolia* P. Beauv.: 38 (1807); Roem. & Schult. : 118 (1817).

F. cymosa R. Br.: 228 (1810); Kunth: 244 (1837); Kern: 557 (1974); R.W. Haines & Lye: 80 (1983); Goetgh. & Coudijzer: 85 (1984). Type from Australia.

F. spathacea Roth: 24 (1821); Kunth: 246 (1837); Steud.: 114 (1855). Type: from India.

F. rigidula Ridl.: 150 (1884).

Icones: C.B. Clarke: t. 43, figs 7–11 (1909); R.W. Haines & Lye: fig. 125 (1983); Goetgh. & Coudijzer: fig. 1A (1984) achene only; Vanden Berghen: fig. 179 (1988) as *Fimbristylis cymosa*.

Vouchers: *K.D. Huntley 727; C.J. Ward 311, 663, 1311, 4789, 7672.*

Description: Gordon-Gray: 180 (1959).

Distribution: Coast, Maputaland.

Plants perennial with rather short, stiff almost succulent leaves forming a radiating rosette surrounding each shoot. In Natal, as in other parts of distributional range, occur always close to sea; along sandy beaches; in shallow soil in rock crevices especially where fresh water trickles; in estuarine, low-lying grassland (often with *Fimbristylis ferruginea*). Variation in plant height and in inflorescence form.

In favourable microhabitats culm height up to 700 mm with inflorescence anthelate (obviously branched); in more exposed, harsh situations culms reach 40–50 mm only and bear single heads, seldom exceeding 10 mm in diameter, in which the sessile, or almost sessile, spikelets are closely massed (branches very reduced or lacking). In Natal, florets develop 3 or 2 stamens, but always 3 style arms and trigonous achenes, which, at full maturity, are dark brownish black, eventually overlaid with the white, loosening cell walls of pericarp. The general appearance,

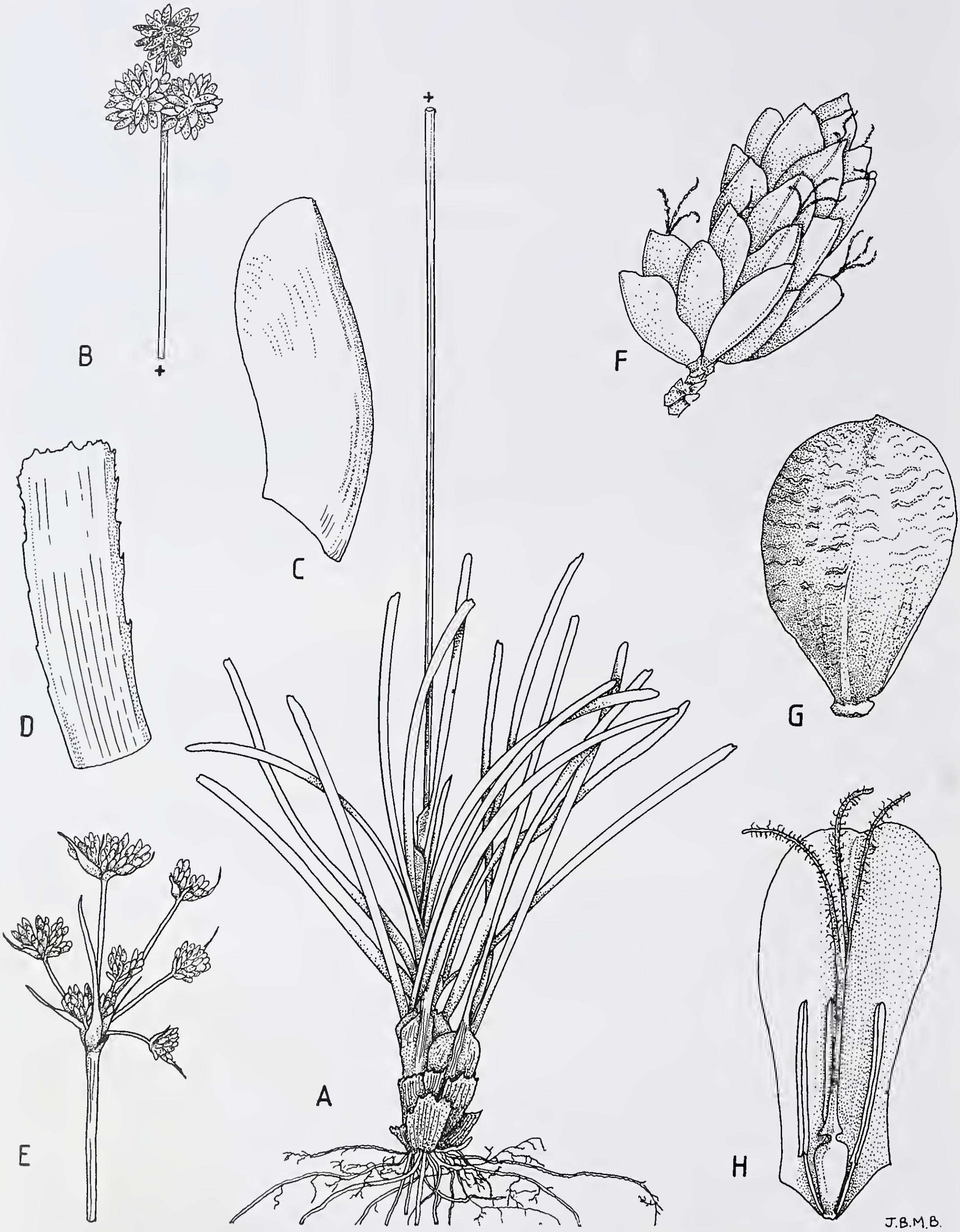

FIGURE 36.—*Fimbristylis obtusifolia.* A–D, F–H, *Huntley 727*; *E. Ward 663.* A, plant, × 1; B, inflorescence: such reduced branching is not uncommon in Natal, bracts are developed, but hidden, × 1; C, glume, lateral view, × 32; D, leaf blade apex, × 5; E, inflorescence, young, but showing branching, × 1.5; F, spikelet, basal glumes shed, × 16; G, achene, × 64; H, floret with subtending glume flattened, × 32.

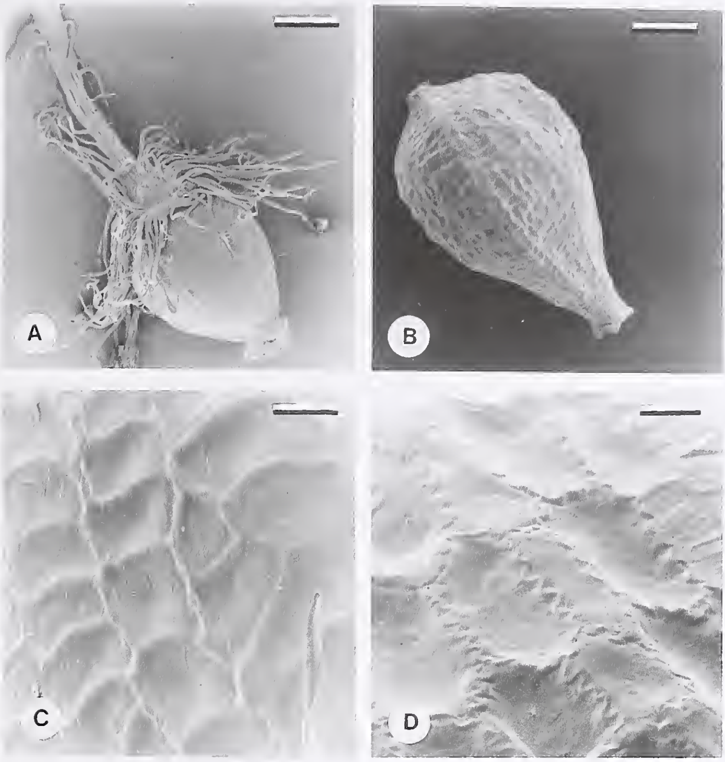

FIGURE 37.—*Fimbristylis*. A, C, *F. squarrosa, Bayer 1503*; B, D, *F. variegata, K.D. Gordon-Gray 6246*. Scale bars: A, B, 250 µm; C, D, 25 µm.

the dark achenes, and the preferred habitats, make identification simple.

F. obtusifolia has been regarded as American and African, whereas Indian and Asian plants, identical in general facies, have been named *F. spathacea* and *F. cymosa*. The only significant difference is in number of style branches (*F. obtusifolia*: 3; *F. spathacea*: 2; *F. cymosa sensu stricto*: 3, but tending to digyny even within individual plants). Recent published work suggests increasing acceptance of the whole pantropical plexus as a single species, for example Haines & Lye (1983) cite *F. obtusifolia* as a synonym of *F. cymosa*. Koyama (1985) wrote of *F. cymosa* as 'This cosmotropical polymorphic species..' and gave the opinion that *F. spathacea* is no more than a subspecies of *F. cymosa*. He did not consider *F. obtusifolia*. Goetghebeur & Coudijzer (1984) name the Central African plants *F. cymosa*. Under this name they incorporated other African plants by citing in synonymy '*F. obtusifolia* auct. plur. non (Lam.) Kunth.' Reid (1985) lists southern African plants under *F. obtusifolia*. This name is used as correct in the present updating, but requires further consideration in relation to the whole plexus.

9. **Fimbristylis squarrosa** *(Poir.) Vahl*, Enumeratio plantarum 2: 289 (1805); Kunth: 224 (1837); Steud.: 110 (1855); Boeck.: 10 (1871–1873); Ridl.: 149 (1884); C.B. Clarke: 609 (1894b); C.B. Clarke: 200 (1897/98); C.B. Clarke: 413 (1901/02); De Wild.: 207 (1927); Kern: 143 (1955); Podlech: 24 (1967); Gordon-Gray: 380 (1968); R.W. Haines & Lye: 90 (1983); Goetgh. & Coudijzer: 85 (1984). Type: South America, *Loefling s.n.* (C). Figure 37A, C.

Scirpus squarrosus Poir.: 100 (1806) non L. (1771).

F. ecklonii Nees: 145 (1835); Kunth: 226 (1837).

Icones: C.B. Clarke: t. 41, figs 9, 10 (1909); Gordon-Gray: fig. 10 (1968); R.W. Haines & Lye: figs 152, 153 (1983); Vanden Berghen: fig. 189 (1988).

Vouchers: *Bayer 1503; Venter 5309.*

Description: Gordon-Gray: 380 (1968).

Distribution: Maputaland.

F. squarrosa has been collected in Natal only twice, both gatherings from Richard's Bay where the small tufted annual plants (looking superficially very like small plants of *F. bisumbellata*), grew as pioneers in sand and alluvial mud surrounding small pools.

The hairs, developed from the expanded style base and dependent over the achene, immediately identify the species and distinguish it from *F. bisumbellata*. *F. squarrosa* is further distinguished by: apices of glumes more markedly elongate; basal glumes with keels often pilose; leaf margins often pilose in basal half; stamen solitary, abaxial. *F. bisumbellata*, in Natal, has stamen number variable (from 1–3) sometimes in an individual spikelet.

The closest relative of *F. squarrosa* is probably *F. aestivalis* (Retz.) Vahl, an Indian and Asian taxon not known from Africa.

TABLE 1. Hypogynous whorls in Natal species of *Furena*

Species	Outer Whorl (Ohw.)	Inner Whorl (Ihw.)
ciliaris var. *ciliaris*	3 bristles (sometimes reduced or lacking)	3 scales (blades quadrate, trinervate)
coerulescens	3 bristles (sometimes reduced or lacking)	3 scales or 3 bristles or a mixture of these (very variable)
ecklonii	nil: occasionally 3 bristles, well developed or reduced	3 scales, about achene length with claw equalling half blade length
hirsuta	3 bristles (rarely absent)	3 scales, claws hairy at maturity
leptostachya var. *nudiflora*	lacking	lacking (rarely 1–2 scales in few florets)
obcordata	usually lacking (occasionally very small outgrowths present)	3 scales: claw and apical margin hairy; blade obcordate (width variable); awn short, incurving
pachyrrhiza	3 bristles, usually very small, occasionally absent	3 reduced, slender or slightly expanded outgrowths (rarely 3 well-developed scales, or entirely absent)
pubescens	lacking, or 3 bristles very small, or up to half as long as achene	rarely entirely lacking (often missed); usually 3 slender to slightly expanded outgrowths; occasionally 3 well-developed scales
stricta	3 bristles	3 bristles
umbellata	usually lacking: occasionally 3 small outgrowths; these rarely well developed	3 scales (variable in colour, texture, blade shape and claw length)

10. **Fimbristylis variegata** *Gordon-Gray* in Journal of South African Botany 32: 134 (1966a). Type: South Africa, Natal, Port Shepstone Dist. , Port Edward, Izingolweni Rd., alt. approx. 100 m, *K.D. Huntley 734* (NU, holo.; BM, BOL, K, L, NGB, PRE, PRU iso.). Figure 37B, D.

Abildgaardia variegata (Gordon-Gray) Lye: 547 (1971a).

Icones: Gordon-Gray: t. 2, fig. 2 (1966a).

Vouchers: *J. Browning 366; K.D. Gordon-Gray 6246; K.D. Huntley 734; l'Ons 123/82, 124/82; McClean 380*; (first known record, 1937); *C.J. Ward 1108, 1115* (both Transkei).

Description: Gordon-Gray: 135 (1966a).

Distribution: Coast (south only, Port Shepstone to Port Edward and into the Bizana area of Transkei). Endemic as far as is known.

Plants erect or drooping, slender perennials with leaves reduced to sheaths. Inflorescences usually heads of 2–9 sessile spikelets, but may have 1 or 2 branches added, or may be reduced to solitary spikelets, all possibilities sometimes on individual plants. The golden yellow to buff glumes with deep chestnut-red markings give the entity its specific name. Preferred microhabitats are damp situations in sand along the margins of streamlets and pools and in hollows among sandstone outcrops.

Lye (1971a) transferred this taxon to *Abildgaardia*, but without providing satisfactory supporting evidence. In the present updating of the Natal sedges, *Abildgaardia* is delimited by the criteria proposed by Goetghebeur & Coudijzer (1984). In such context, the achenes of *F. varie-gata*, as well as the glabrous texture of the plants, suggest closer affinity with *Fimbristylis*. Embryo structure remains to be investigated.

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Fuirena *Rottb.*, Descriptionum et iconum rariores: 70 (1773); Nees: 288 (1834b); Kunth: 180 (1837); Boeck.: 634 (1869/70); Boeck.: 98 (1871–1873); C.B. Clarke: 260 (1897/98); C.B. Clarke: 461 (1901/02); Schönland: 50 (1922); Podlech: 24 (1967); J. Kern: 516 (1974); R.A. Dyer: 877 (1976); P.L. Forbes: 117 (1980); P.L. Forbes: 49 (1987b). Type species: *F. umbellata* Rottb.

Vaginaria Pers.: 70 (1805) non Lindl.

Pentasticha Turcz.: 330 (1862).

Scirpus L. subgen. *Fuirena* Kuntze: 331 (1898).

Scirpus L. sect. *Vaginaria* T. Koyama: 286 (1958).

1. **Fuirena ciliaris** *(L.) Roxb.*, Hortus bengalensis: 81 (1814) nom. nud.; Roxb.: 184 (1820); J. Kern: 519 (1974); P.L. Forbes: 170 (1980); R.W. Haines & Lye: 46 (1983). Type: India orientalis, *Koenig* (BM).

Scirpus ciliaris L.: 182 (1771); Rottb.: 55 (1773); T. Koyama: 361 (1958). *F. ciliaris* (L.) K. Schum.: 126 (1895). *F. glomerata* sensu auct. mult. ; Vahl: 386 (1805); Kunth: 184 (1837); C.B. Clarke: 465 (1901/02) non Lam.

F. ciliata Lepr. ex Steud.: 126 (1855). Type: Senegal, prope Caybar, *Leprieur s.n.* (P).

F. canescens Pers.: 70 (1805); Vahl: 385 (1805). Type: Senegal: Herb. Richard.

Icones: J. Kern: fig. 32 (1974); R.W. Haines & Lye: figs 46–48 (1983); T. Koyama: fig. 5A–E (1985); Vanden Berghen: fig. 192 (1988).

Description: R.W. Haines & Lye: 46 (1983).

Key to species

Note: identification of the Natal species is not always straightforward. This is due to variability in morphological form, particularly in the hypogynous whorls, and because relationships among species are often close. Dissection of spikelets is essential as superficial matching can be misleading. Mature achenes are reliable, but seldom present. Abbreviations used in key and/or text (Table 1): Ohw. = Outer hypogynous whorl; Ihw. = Inner hypogynous whorl; scale consists of claw (stalk), blade, and often an awn.

1a Glumes with indumentum of short hairs of uniform length, no long, straight hairs intermingled (Note: consider glumes, not basal bracts) 2
1b Glumes (all, many, or few basal only) with few to numerous long, straight hairs intermingled among short hairs of indumentum 7

2a Mature achenes 1.3–1.6 × 0.7–0.9 mm (including stalk and beak). Surface cells to faces transversely elongate or isodiametric, large enough to be visible under × 10 lens. Glumes 3.5–5.0 mm long (including 0.8–1.7 mm awn), pubescent, except distally where a glabrous band with ciliate edge borders the margin (study younger glumes, as older ones curl and fray). Inner hypogynous whorl (Ihw.) usually of 3 scales, each with scabrid awn. Rhizome 3–9 mm in diameter, scale leaves usually glabrous. Vegetative organs appearing glabrous, but often with patches of short, dense to sparse hairs (readily overlooked) .... 2. *F. coerulescens*
2b Mature achenes with surface cells of faces differing from those of contrast, too small to be visible with × 10 lens. Glumes and Ihw. not precisely as for the contrast. Rhizome variable (well or poorly developed, or lacking) 3

3a Ihw. of 3 scales with hairy claws. Mature achene with long stalk and long cylindrical, often papillate, beak. Lower parts of culm rounded, glabrous, leaf sheaths usually shorter than internodes .... 4. *F. hirsuta*
3b Ihw. of bristles, or absent; if scales present then claws glabrous and mature achenes different from those of contrast 4

4a Ihw. of 3 bristles. Glume awn 0.2–0.8 mm long. Rhizome absent (occasionally poorly developed) .... 9. *F. stricta*
4b Ihw. lacking, or of 3 slender or slightly expanded outgrowths, rarely of 3 clawed, aristate scales approximately equalling mature achene length. Glume awn (0.8–)1.0–3.0 mm long. Rhizome elongate or contracted (always present) 5

5a Plants with indumentum of uniform, short, patent hairs 0.1–0.2 mm long on all parts, except towards base where glabrescent .... 7. *F. pachyrrhiza*
5b Plants with indumentum limited to small portions of plant such as inflorescence, OR culm apex, OR nodes, OR midribs and margins of leaf blades, OR partly or completely covering sheaths and ligules; if indumentum more extensive, then hairs longer than 2 mm 6

6a Ihw. of 3 scales equalling or slightly shorter than mature achene (rarely 1–2 scales smaller). Achene 1.6–2.5 mm long. Culm leafy, the sheaths covering all, or almost all, internodal length. (Coast and hinterland; not presently known north of Stanger) .... 3. *F. ecklonii*
6b Ihw. of 3 short outgrowths from receptacle (easily overlooked if floret imperfectly removed from rachilla), rarely larger (then differentiated into claw, blade, awn), sometimes entirely lacking. Mature achene 1.0–1.6(–1.8) mm long (widespread) .... 8. *F. pubescens*

7a Culms and leaf sheaths 5-angled; blades with 5 well-marked nerves (observe several culms). Ihw. of 3 scales with very short, straight claws. (Maputo and north coast; not known south of Durban) .... 10. *F. umbellata*
7b Culms and leaf sheaths 3-angled to terete; blades with only midrib well-marked; if additional nerves visible then the number not regularly 5. Ihw. variable; if of 3 obcordate scales equalling achene in length, then scale claws short, hairy, and scale margins with some hairs basally and apically 8

8a Ihw. of 3 obcordate scales equalling mature achene in length, claws very short, hairy, scale margins with some hairs basally and apically. Epidermal cells of mature achene visible under × 10 lens. (Coast) .... 6. *F. obcordata*
8b Ihw. variable, sometimes lacking. When present, never as for the contrast, usually with well-developed claws (hairy in *F. hirsuta*, otherwise glabrous). Epidermal cells of mature achene not visible under × 10 lens 9

9a Ihw. of 3 scales with well-developed, hairy claws. Culms smooth, except occasionally below inflorescence. Rhizome well developed .... 4. *F. hirsuta*
9b Ihw. variable; if scales developed, then claws glabrous. Culms more or less ribbed. Rhizome usually absent, rarely poorly developed 10

10a Stamens 3 per floret. Spikelets 2.0–3.2 mm wide. Mature achenes (0.7–)0.8–1.1(–1.3) mm long. Hypogynous scales and bristles present .... 1. *F. ciliaris*
10b Stamens 2 per floret. Spikelets 1.3–2.3 mm wide. Mature achenes 0.4–0.7 mm long. Hypogynous scales and bristles lacking (occasionally 1 or 2 scales in a few florets only) .... 5. *F. leptostachya*

This tufted, fibrous-rooted annual is widely distributed in tropical and subtropical regions of the Old World.

For southern Africa, Forbes (1980) recognised five varieties based on variations in the hypogynous whorls. Two of these are unpublished combinations.

In Natal, *F. ciliaris* is represented only by the typical element.

var. **ciliaris** (Figure 38A, D)

Vouchers: *Alletson 4* (CPF); *Lawson 496; Pooley 1644; Tinley 89; G.F. van Wyk 389* (CPF); *C.J. Ward 7695.*

Description: P.L. Forbes: 174 (1980).

Distribution: Maputaland.

Plants lacking rhizome, 300–500 mm in height, tufted, leafy herbaceous, usually densely hairy. Inflorescence of closely compacted spikelets, each (5–)7–12(–18) × 2.0–3.2 mm (awns excluded), squarrose. Glumes 2.0–3.6 mm long (recurving awn 0.8–1.2 mm long included). Ohw. of 3 retrorsely scabrous bristles, equalling scale claw in length. Ihw. of 3 scales equalling or slightly shorter than mature achene; claw equalling blade in length, blade quadrate, trinervate, flat. Achene (0.7–)0.8–1.1(–1.3) mm

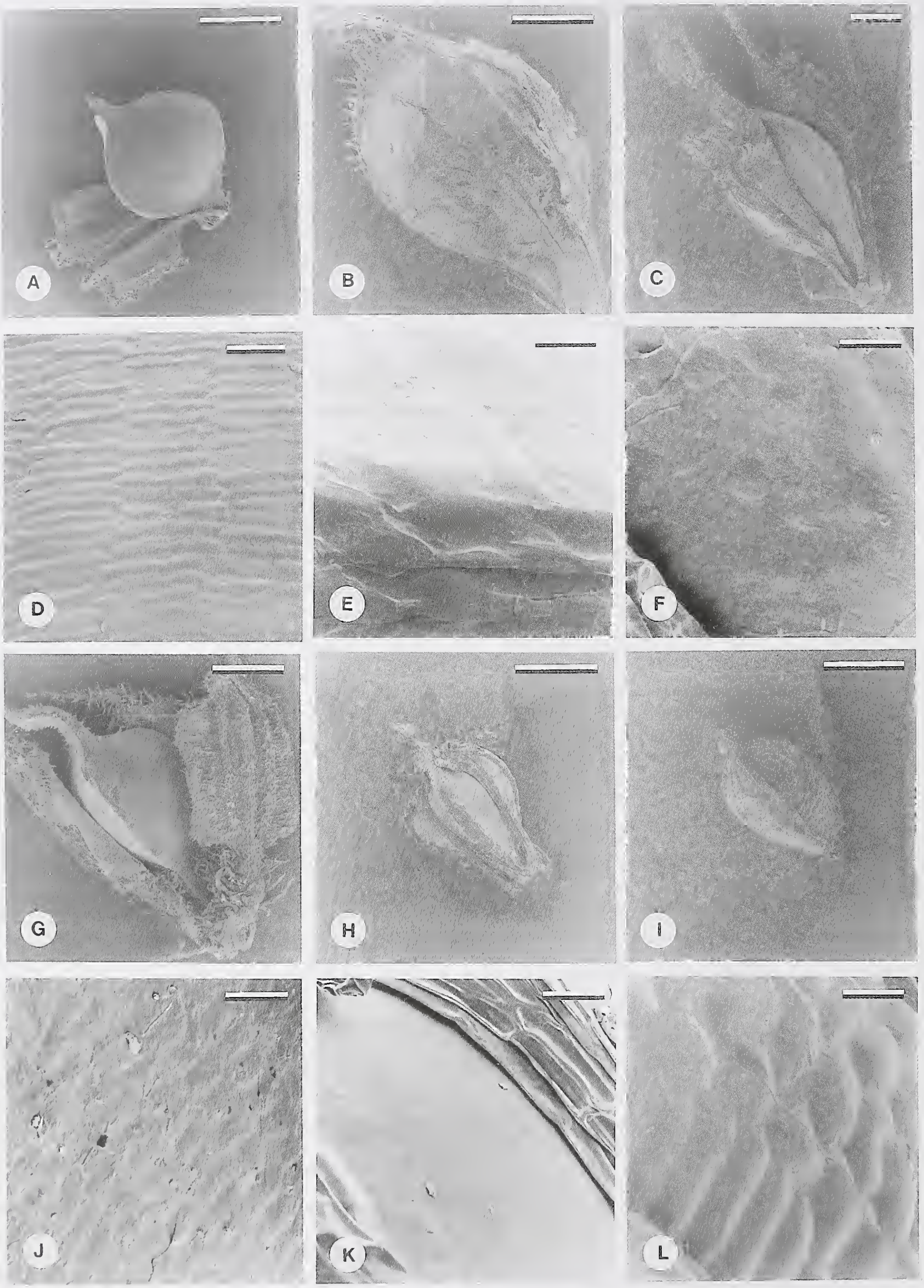

FIGURE 38.—*Fuirena*. A, D, *F. ciliaris* var. *ciliaris*, *Balkwill 640a*; B, E, *F. coerulescens*, *Shirley s.n.*; C, F, *F. ecklonii*, *Ward 5163*; G, J, *F. hirsuta*, *Ward 2107*; H, K, *F. leptostachya* var. *leptostachya*, *Forbes 648* (from Transvaal; not in Natal); I, L, *F. leptostachya* var. *nudiflora*, *Letley s.n.*. Scale bars: A–C, G–I, 250 µm; D–F, J–L, 25 µm.

long (stalk and beak included); surface faintly transversely wavy.

Plants grow amongst short grasses along margins of vleis and streamlets, usually in organically rich sand; grazed by hippo.

2. **Fuirena coerulescens** *Steud.*, Flora oder Botanische Zeitung 12: 153 (1829); Schrad.: 51 (1832b); Nees : 510 (1832); Nees: 142 (1835) var. Y excl.; Kunth: 180 (1837) var. Y excl.; Steud.: 125 (1855); Boeck.: 638 (1869/70) p.p.; Boeck.: 102 (1871–1873) p.p.; C.B. Clarke: 645 (1894b) p.p.; C.B. Clarke: 263 (1897/98) p.p.; Schönland: 51 (1922); Levyns: 118 (1950); P.L. Forbes: 208 (1980); P.L. Forbes: 49 (1987b). Type: Cape Province, Cape Flats, *Ecklon 868* (K, PRE, iso.). Figure 38B, E.

Scirpus coerulescens Kuntze: 336 (1898).

F. gracilis Kunth: 181 (1837); Boeck.: 636 (1869/70); Boeck.: 100 (1871–1873); C.B. Clarke: 647 (1894b) p.p.; C.B. Clarke: 263 (1897/98) p.p. Type: Cape Province 'Zwischen Gekau und Basche', *Drège 4341* (K, P, iso.; holo. destroyed).

F. enodis C.B. Clarke: 646 (1894b) nom. nud.; C.B. Clarke: 263 (1897/98) description; Schönland: 52 (1922). *Scirpus enodis* (C.B. Clarke) T. Koyama: 287 (1958). Type: Cape Province, Griquatown, *Burchell 1865* (K, holo.; P, iso.).

F. subdigitata C.B. Clarke: 478 (1906c); Brain: 80 (1934). Type: Rhodesia (Zimbabwe), Matopo Hills, *Gibbs 196* (K).

F. reticulata Kük.: 271 (1938a); Podlech: 25 (1967). Type: South West Africa (Namibia), Grootfontein, *Schoenfelder S472* (PRE, holo.).

Icones: C.B. Clarke: t. 59, figs 3, 4, (1909); P.L. Forbes: figs 32–48 (1980) (photographs of herbarium specimens showing range in form: all should be considered in relation to plants from Natal, but especially the inland form fig. 45, *P.L. Forbes 550*).

Vouchers: *Acocks 10292* (PRE); *Johnstone 263*; *Mogg 4497* (PRE, SRGH).

Description: P.L. Forbes: 208 (1980).

Distribution: Coast, Midlands, southern Natal.

Widespread in southern Africa, and very variable morphologically, especially in the range of structures comprising the outer and inner hypogynous whorls. Natal plants perennial with an elongate woody rhizome 3–9 mm in diameter and erect culms with leaves mainly in the lower half, blades narrow with incurved margins and slightly glaucous colour. Terminal or pseudolateral inflorescence with 1–6 dark spikelets. Ihw. usually of scales. Plants occupy temporarily wet situations, usually seasonal vleis, pans or damp depressions in grassveld, often where vegetational cover is sparse.

Identification is difficult, especially if mature achenes are not present. Key characters should be considered collectively. In Natal *F. coerulescens* is most frequent in northern Natal, but of possible occurrence throughout the geographic area (except Uplands). Distributional limits are not fully known.

3. **Fuirena ecklonii** *Nees* in Linnaea 9: 288 (1834b) nom. nud.; Nees: 143 (1835) description; Kunth: 186 (1837); C.B. Clarke: 646 (1894b); C.B. Clarke: 264 (1897/98); P.L. Forbes: 243 (1980). Syntypes: Cape Province, In sylvis primaevis montis Olyfantshoek ad Flumen Boschesmannsrivier, Uitenhage, *Ecklon* (toposyn. PRE); circa urbem Grahamstown (Albany), *Ecklon*; in valle quadam planitiei Quaggas Vlackte dictae, *Ecklon*. Figure 38C, F.

F. mollicula Kunth: 182 (1837) var. B. Syntypes: Cap. b. spei, ad oram orientalem, *Drège 4340* (P, isosyn.); *Drège 2039* (P, isosyn.).

F. coerulescens Steud. var. *glabrescens* Schönland: 51 (1922). Syntypes: Cape Province: Olifantshoek, *Ecklon & Zeyher*; Bethelsdorp, *Paterson 347*. Natal: Clairmont, *Wood 9969*; Kokstad, *Tyson 1469*. Transkei, Ibisi River, *Wood 3144*.

F. coerulescens auct. mult. ; Boeck.: 638 (1869/70) p.p.; Boeck.: 102 (1871–1873) p.p.; C.B. Clarke: 645 (1894b) p.p.; C.B. Clarke: 264 (1897/98) p.p. non Steud.

Icones: C.B. Clarke: t. 59, fig. 10 (1909); P.L. Forbes: figs 49, 50 (1980).

Vouchers: *P.L. Forbes 361; K.D. Huntley 782; Lubke 1480* (J); *C.J. Ward 5163, 5525, 9337.*

Description: P.L. Forbes: 244 (1980).

Distribution: Coast, Mtamvuna River to Stanger only.

Plants grow usually in permanent water of shallow streamlets, seeps or vleis. Woody rhizome, 2.0–3.5 mm in diameter, with erect culms at 2–15 mm intervals. Leaves numerous, sheaths usually covering culms so that internodes not visible. This last criterion is the easiest means of identification, but confirmation must be obtained by observation of the 3 clawed scales of Ihw. that equal or are slightly shorter than mature achene. Size of achene is also confirmatory. *F. ecklonii* has been much confused with *F. coerulescens* (No. 2), and the species are sympatric in the coastal region. Essential differences are:

F. ecklonii

Culms leafy throughout (6–15 upper leaves with long blades, lower with blades reduced). Glumes uniformly pubescent. Mature achene (stalk & beak included) 1.6–2.5 mm long. Ihw. with awn to blade subterminal, developed from inner adaxial face.

F. coerulescens

Culms with leaves mostly in lower half (usually 6 or fewer). Glume with submarginal glabrous band and ciliate edge. Mature achene (stalk & beak included) 1.3–1.6 mm long. Ihw. with awn to blade terminal, directly excurrent.

4. **Fuirena hirsuta** *(P.J. Bergius) P.L. Forbes* in Journal of South African Botany 35: 83 (1969). Type: 'e Cap. b. sp.' sent to Bergius by M. Grubb. Bergius Bot. Garden Herbarium (S). Figure 38G, J.

Cyperus hirsutus P.J. Bergius: 11 (1767); Roem. & Schult. : 225 (1817); Kunth: 114 (1837).

Scirpus hottentottus L.: 182 (1771); Rottb.: 54 (1773); L.: 101 (1784); Thunb.: 18 (1794); Thunb.: 370 (1811). *F. hottentotta* (L.) Levyns: 118 (1950). *F. hirta* Vahl: 387 (1805); Schrad.: 52 (1832b); Nees: 510 (1832b); Nees: 142 (1835); Kunth: 181 (1837); Boeck.: 108 (1871–1873); C.B. Clarke: 647 (1894b) nom. nud.; Schönland: 55 (1922). Type: South Africa, Cap. b. spei, locis paludosis ad rivulosis, *Koenig*.

F. glabra Kunth: 182 (1837); Boeck.: 101 (1871–1873); C.B. Clarke: 646 (1894b); C.B. Clarke: 264 (1897/98). Type: S Africa, Cape, *Ecklon 882*.

Less well known synonyms have been omitted. For these see Forbes (1969).

Icones: Rottb.: t. 16, fig. 4 (1773); Schönland: t. 55 (1922); P.L. Forbes: figs 1–7 (1969).

Vouchers: *K.D. Gordon-Gray 4760, 6134; C.J. Ward 753, 2107, 3476.*

Description: P.L. Forbes: 84 (1969).

Distribution: Coast (including immediate hinterland); N Natal (Itala), Maputaland.

Plants perennial with woody rhizome 3–8 mm in diameter bearing erect culms at intervals of up to 20 mm apart, growing in damp to wet situations along entire Natal coastline, favouring riverine fringes and a sandy substrate. Identification by the following characters is not difficult as the species is distinctive among Natal representatives : 1, hairy claws of scales of Ihw.; 2, terete or bluntly 3-angled, glabrous culms (occasionally there is a short hirsute zone immediately below inflorescence); 3, mature achene with long slender stalk and long cylindrical beak, both, one, or neither, with papillate projections.

Natal plants develop few long straight hairs on glumes, in contrast to plants from western Cape (glumes densely hirsute), and those from eastern Cape and Transkei (glumes variable) (P.L. Forbes: fig. 4, 1969).

5. **Fuirena leptostachya** *Oliv.* in Transactions of the Linnean Society 29: 168 (1875); C.B. Clarke: 647 (1894b); C.B. Clarke: 466 (1901/02); P.L. Forbes: 181 (1980); P.L. Forbes: 50 (1987b). Type: Uganda, about Madi, 3°15′ N, *Grant s.n.* (K, holo.).

F. schweinfurthiana Boeck.: 438 (1880). Type: Central Africa, *Schweinfurth*, probably *Schweinfurth Ser. 3, 190* (K, P).

F. ciliaris (L.) Roxb., Podlech: 26 (1967) pro min. part.

F. glomerata sensu Boeck.: 566 (1879) non Lam.

Icones; Oliv.: t. 108, fig. B (1875) (Forbes states that in no. of stamens, midrib to leaf blades and shape of hypogynous scales, the illustration is not accurate); C.B. Clarke: t. 59, fig. 6 (1909).

Description: P.L. Forbes: 182 (1980).

Plants tufted, fibrous-rooted, hirsute annuals very similar in facies to those of *F. ciliaris* (No. 1). Forbes (1980) studied both species over a wide distributional range and found the most reliable morphological difference to be stamen number (2 per floret in *F. leptostachya*: 3 in *F. ciliaris*). There were also narrower spikelets and shorter achenes in *F. leptostachya* (see key at 10a & 10b).

Within *F. leptostachya* (Forbes *l.c.*) found two expressions of the hypogynous whorl represented; one in which the Ohw. consists of 3 retrorsely scabrid bristles, the Ihw. of 3 anchor-shaped, clawed scales (these consistent in every floret of a spikelet) and the second with florets lacking both Ohw. and Ihw. (very occasionally 1 or 2 scales may be present in a few florets of an inflorescence). These differences were incorporated in two varieties.

var. *leptostachya* (Figure 38H, K)

Plants widely distributed through most of tropical sub-Saharan Africa. In southern Africa from Namibia, Botswana and Transvaal. Not known from Natal.

var. **nudiflora** *C.B. Clarke* in Conspectus florae africae 5: 647 (1894b) nom. nud.; C.B. Clarke: 462 (1901/02) description; P.L. Forbes: 185 (1980). Type: Ethiopia, Gir, *Schweinfurth 2504* (K). Figure 38I, L.

Fuirena pygmaea Welw. ex Ridl.: 160 (1884); C.B. Clarke: 648 (1894b); Rendle: 128 (1899); C.B. Clarke: 464 (1901/02). Syntypes: Angola, Pungo Andongo, Sansamanda, *Welwitsch 7111, 7171* (BM); Dist. Huilla, Monino, *Welwitsch 7112* (BM).

F. moiseri Turrill: 71 (1925). Type: Northern Nigeria, Fodama, *Moiser 157* (K, holo.).

F. microcarpa Lye: 111 (1974a); Wingfield: 320 (1977); Type: Tanzania, Manzese pond, Morogoro Rd., Dar es Salaam, *Wingfield 2100* (DSM, holo.: C, EA, K, MO, NU, J ex NU, iso.).

Vouchers: *O. Letley s.n.; C.J. Ward 3083.*

Distribution: Zululand, Umfolozi Game Reserve.

F. leptostachya var. *nudiflora* is not common in Natal. Plants may well have been overlooked since they grow only during the summer season on the margins of temporary vleis and ponds, among other grasses and sedges.

6. **Fuirena obcordata** *P.L. Forbes* in South African Journal of Botany 52: 237 (1986); P.L. Forbes: 185 (1987a). Type: South Africa, Port Natal (Durban) *Drège 4339* (P, holo.). Figure 39A, D.

F. microlepis Kunth: 182 (1837) quoad *Drège 4339* (descrip. et *Drège 4338* excl.). *F. pubescens* (Poir.) Kunth, Boeck.: 640 (1869/70) p.p. quoad *Drège 4339*; Boeck.: 104 (1871–1873) p.p.

F. glabra Eckl. ex Hochst. : 757 (1845) non Kunth. Syntypes: Natal, Umlaas, *Krauss 59, 191* (K).

F. microlepis sensu C.B. Clarke: 647 (1894b); C.B. Clarke: 262 (1897/98); sensu Schönland: 52 (1922) *Sim 2712* excl.; sensu Gordon-Gray: 108 (1972); non Kunth: 182 (1837) *Drège 4339* excl.

F. coerulescens Steud. var. *glabrescens* Schönland: 51 (1922) quoad *Wood 9969.*

Icones: P.L. Forbes: fig. 35 (1980); P.L. Forbes: fig. 1 (1986).

Vouchers: *Cl. Reid 564, 1064* (PRE); *Strey & Moll 3866* (PRE); *C.J. Ward 2785, 7323; M.C. Ward 286, 868.*

Description: P.L. Forbes: 238 (1986).

Distribution: Coast, Maputaland.

Plants perennial with rhizomes 4–6 mm in diameter that carry contiguous or closely placed culms, growing in shallow water or in very wet swamps, usually in a sandy, organically rich substrate.

There is close similarity in general facies with *F. umbellata* (No. 10), but the 5-angled sheaths and culms and the regularly 5-nerved leaves of that species provide means of distinction (so also the scales to the Ihw. that are never hairy in *F. umbellata*, but provided with short marginal hairs basally and apically in *F. obcordata*). There is also close relationship with *F. hirsuta* (No. 4).

Along the Natal coastline north of Scottburgh, in Maputaland and in Mozambique, *F. umbellata* and *F. hirsuta* are sympatric. *F. obcordata* may also be present.

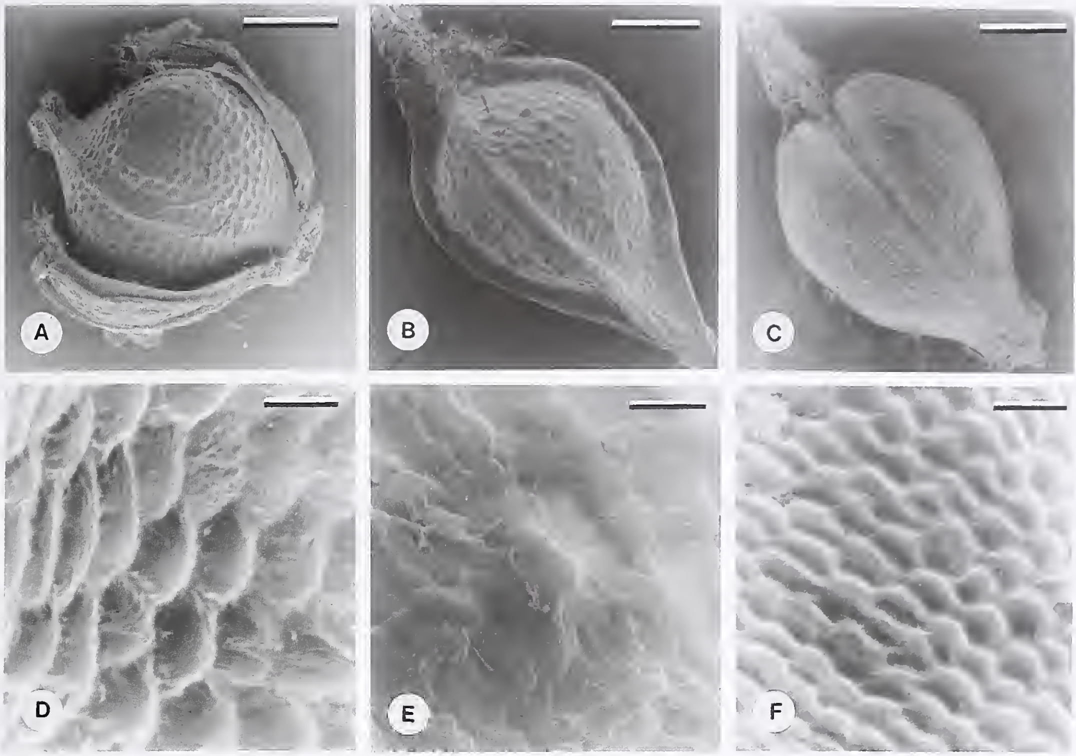

FIGURE 39.—*Fuirena*. A, D, *F. obcordata*, *J. Browning 171*; B, E, *F. pachyrrhiza*, *Ward 3646*; C, F, *F. pubescens*, *J. Browning 166*. Scale bars: A–C, 250 μm; D–F, 25 μm.

7. **Fuirena pachyrrhiza** *Ridl.* in Transactions of the Linnean Society, Botany, Ser. 2, 2: 161 (1884); C.B. Clarke: 647 (1894b); C.B. Clarke: 262 (1897/98); C.B. Clarke: 464 (1901/02); Schönland: 51 (1922) p.p.; Podlech: 25 (1967); P.L. Forbes: 247 (1980). Syntypes: Angola, Dist. Pungo Andongo, prope Muta Lucala, *Welwitsch 7117* (BM); inter Caghui et flumen Cuanza, *Welwitsch 7118* (BM). Figure 39B, E.

F. pubescens (Poir.) Kunth var. *major* Lye: 112 (1974a).

F. macrostachya Boeck.: 507 (1884). Type: Tanzania, *Böhm 73a*.

F. coerulescens Steud. var. *buchanani* C.B. Clarke: 646 (1894b) nom. nud.; C.B. Clarke: 263 (1897/98), description. Type: Natal, without precise locality, *Buchanan 120* (K, holo.).

Icones: P.L. Forbes: figs 52–54 (1980) (photographs of types).

Vouchers: *P.L. Forbes 362* (J); *Hilliard 3118; King 428; Tinley 644; C.J. Ward 113, 3646; Wood 1194* (NH, PRE).

Description: P.L. Forbes: 248 (1980).

Distribution: Coast, Midlands, Zululand (N Natal?).

In southern Africa, Forbes (1980) found plants that are characterised by a uniform indumentum of short patent hairs that is lacking from comparatively small basal portions only. On the quality and extent of this indumentum (dense and soft, giving leaves and culms a velutinous texture), she differentiated *F. pachyrrhiza* from the closely related *F. pubescens* (No. 8) and *F. ecklonii* (No. 3) in both of which the indumentum is limited to small portions only of culms and leaves. Forbes mentioned that in tropical Africa, the distinction in indumentum between *F. pachyrrhiza* and *F. pubescens* is not nearly so marked. This is probably the reason why Haines & Lye (1983) reduced *F. pachyrrhiza* to varietal rank as *F. pubescens* var. *major*.

In Natal, plants of *F. pachyrrhiza* have a facies different from that of *F. pubescens* (and from *F. pachyrrhiza* in much of its area) but contrasts are not readily expressed verbally. It is best to consult cited herbarium specimens in order to become familiar with the different ‘look’, before undertaking the identification of unnamed plants. Natal plants tall, robust perennials with thick rhizomes bearing usually contiguous culms. Leaf blades (3.5–)6–15 mm wide; large spikelets loosely arranged within paniculate inflorescence. Glumes glabrescent, each with an awn arising 0.5–0.7 mm below apex. Awns spread at angles of 60° to 90° from spikelet surface, giving it a ‘bristly’ look. In *F. pubescens*, and *F. pachyrrhiza* through the remainder of its distributional area, the awns do not project markedly, nor are plants generally as large.

Plants grow in wet to damp situations on margins of vleis and near streams, often amongst shrubs fringing small patches of trees where the continuity of coast forest has been disturbed. Their total area (together with localities in parts of the eastern Transvaal and eastern Cape, where this ‘echinate’ form is also known), constitutes a small peripheral zone of the total distributional area of *F. pachyrrhiza*. *Buchanan 120*, without precise locality in Natal, is more typical of *F. pachyrrhiza* than are most Natal plants of this species.

8. **Fuirena pubescens** *(Poir.) Kunth*, Enumeratio plantarum 2: 182 (1837); Steud.: 649 (1841); Boeck.: 640 (1869/70) p.p.; Boeck.: 104 (1871–1873) p.p.; Boeck.: 566 (1879); C.B. Clarke: 648 (1894b); C.B. Clarke: 261 (1897/98); Rendle: 128 (1899); C.B. Clarke: 463 (1901/02); Podlech: 25 (1967); P.L. Forbes: 252 (1980); Hilliard: 56 (1987); Hilliard & B.L. Burtt: 114 (1987); P.L. Forbes: 50 (1987b). Type: NE Algeria (Numidia), prope La Calle, *Poiret s.n.* (P, holo., iso.). Figures 39C, F; 40.

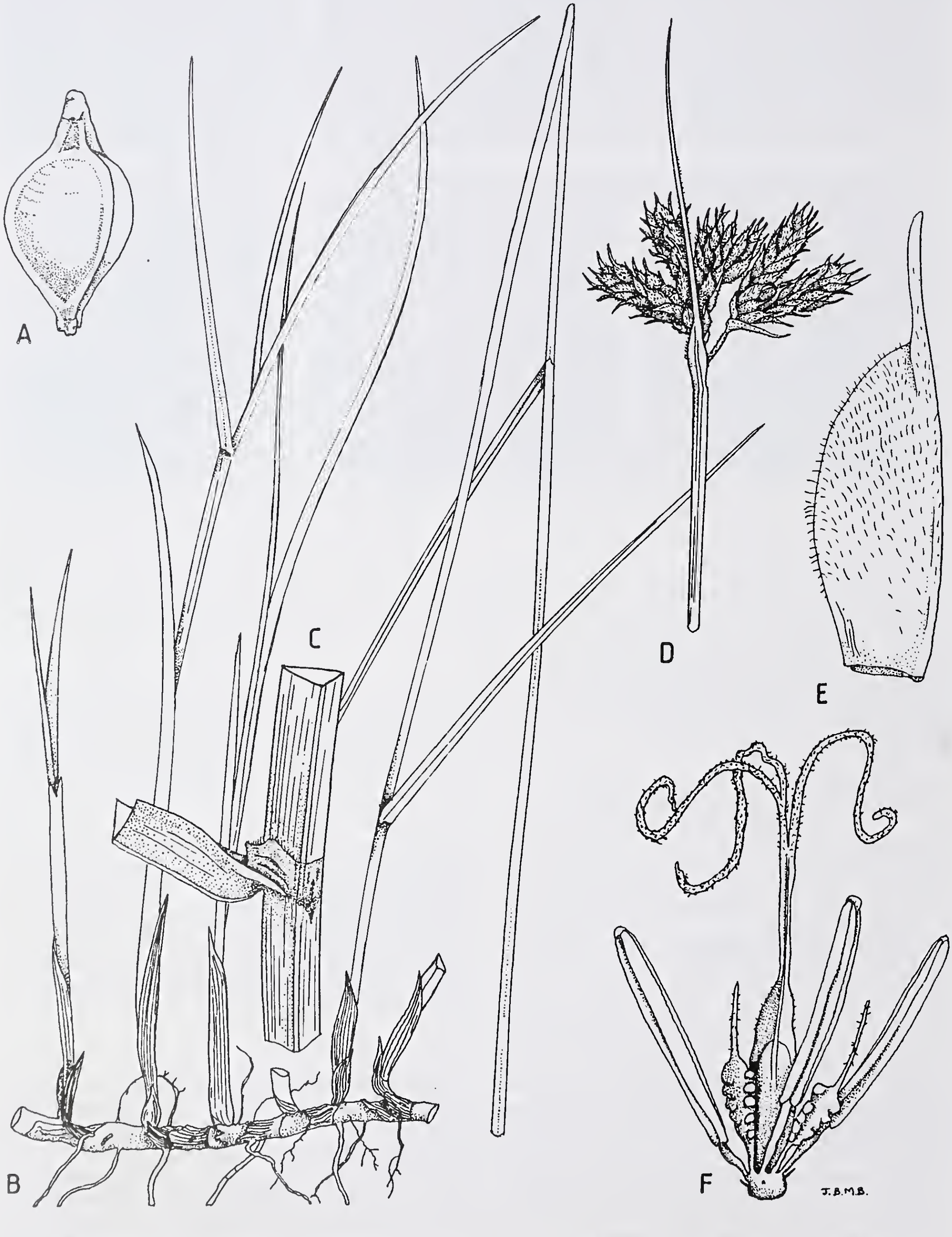

FIGURE 40.—*Fuirena pubescens*. A, E, F, *J. Browning 165, 166*; B–D, *Taylor 36*. A, achene, × 29; B, plant, × 0.9; C, ligule, × 3.8; D, portion of inflorescence, × 1.9; E, glume, lateral view: (indumentum of short hairs only), × 24; F, floret with scales of inner hypogynous whorl (scales not always developed), × 27.

Carex pubescens Poir.: 254 (1789). *Scirpus pubescens* (Poir.) Lam.: 139 (1791); Poir.: 760 (1804); Vahl: 274 (1805). *C. poiretii* J.F. Gmel.: 140 (1796). *Isolepis pubescens* (Poir.) Roem. & Schult.: 118 (1817) non Mant.; Steud.: 442 (1821).

F. welwitschii Ridl.: 161 (1884); C.B. Clarke: 649 (1894b); Rendle: 128 (1899); C.B. Clarke: 463 (1901/02). Syntypes: Angola Dist. Pungo Andongo prope Quibanga, *Welwitsch 7108* (BM); Dist., Huilla, prope Lopollo, *Welwitsch 7114* (BM); prope Eme, *Welwitsch 7115* (BM).

F. buchanani Boeck.: 20 (1888); K. Schum.: 126 (1895). *F. pubescens* (Poir.) Kunth var. *buchanani* (Boeck.) C.B. Clarke: 648 (1894b). Type: Malawi, Shire, *Buchanan 1453* (K).

Icones: Davis in Hilliard: 56 (1987).

Vouchers: *J. Browning 166; Edwards 2354; K.D. Huntley 315, 706; Strey 4918; C.J. Ward 1197, 2845.*

Description: P.L. Forbes: 253 (1980).

Distribution: widespread.

Most widely distributed species in Natal. Before Forbes' revision, this name was a repository for many Natal gatherings that were not easily identifiable. Plants may be recognised by: the well-developed elongate rhizome and indumentum of uniform, short, patent hairs limited to small portions such as culms, or nodes, or midribs and margins of leaf blades, or inflorescences; reduced hypogynous whorl consisting of minute outgrowths, or these may be entirely absent. (Note: when mature, achene easily detached leaving base of floral axis *in situ*: it is this axis that carries the rudimentary hypogynous whorl, so the outgrowths may be missed). Occasionally, especially along Maputaland coast, three scales may be present. These are variable in development, even within a spikelet, from slender to fully expanded and then equalling the achene in length.

Populations often localised in depressions in seasonally inundated grassveld that is wet or damp for most of growing period. Also occur in vleis and along river margins. Depending upon habitat conditions, plants very variable in height, robustness and in extent of tufting.

9. **Fuirena stricta** *Steud.*, Synopsis plantarum glumacearum 2: 128 (1855); Boeck.: 635 (1869/70); Boeck.: 99 (1871–1873); C.B. Clarke: 648 (1894b); C.B. Clarke: 465 (1901/02); P.L. Forbes: 268 (1980); R.W. Haines & Lye: 42 (1983); P.L. Forbes: 50 (1987b). Type: Madagascar et Comores, *Boivin s.n.* (K). Figure 41A, C.

Pentasticha madagascariensis Turcz.: 330 (1862). Type: Madagascar, *Boivin s.n.* (K).

F. chlorocarpa Ridl.: 159 (1884); C.B.Clarke: 645 (1894b); C.B. Clarke: 262 (1897/98); Rendle: 128 (1899); C.B. Clarke: 465 (1901/02); Schönland: 51 (1922); Podlech: 25 (1967). *F. stricta* Steud. var. *chlorocarpa* (Ridl.) Kük.: 310 (1925); Kük.: 78 (1934); Kük.: 388 (1936/37); Hooper & Napper: 326 (1972). Type: Angola, Huilla, in paludosis ad rivorum margines in Lopollo, *Welwitsch 7113* (BM, holo.).

F. friesii Kük.: 8 (1921). Type: Zambia, near Fort Rosebery, *Schwed. Rhod.-Kongo Exped. 614.*

Icones: Kük.: t. 3, fig. 2 (1921) as *F. friesii*; P.L. Forbes: figs 64–67 (1980); R.W. Haines & Lye: figs 14A, 36–38 (1983); Vanden Berghen: fig. 193 (1988).

Vouchers: *Buchanan 342* (GRA, K, NH, PRE), *362* (K, NH); *P.L. Forbes 360* (J, NU); *K.D. Gordon-Gray 6194*, 6249; *Ross 1614*.

Description: P.L. Forbes: 269 (1980).

Distribution: Coast, Midlands, Uplands.

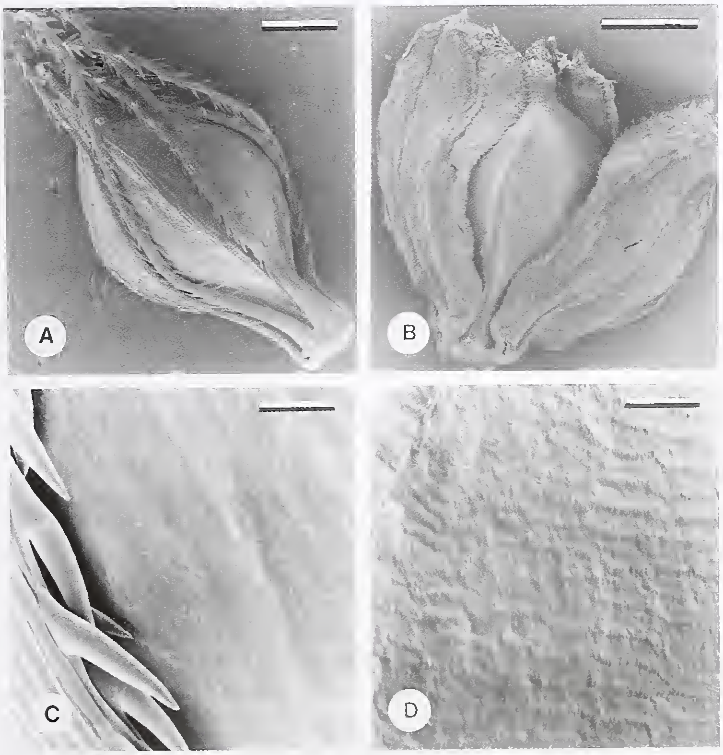

FIGURE 41.—*Fuirena*. A, C, *F. stricta*, *Ross 1614*; B, D, *F. umbellata*, *Tinley 255*. Scale bars: A, B, 250 µm; C, D, 25 µm.

Characters of *F. stricta* well marked, namely: tufted habit, without or with poorly developed, short rhizome; puberulous glumes; Ohw. and Ihw. each of 3 bristles; achene surface, appearing smooth, but at high magnification consisting of subquadrate to irregular cells with sinuous anticlinal walls (difficult to observe, even in electron micrographs).

The species shows morphological variability, particularly in ranking, or not, of glumes. Smaller plants (of more rigorous habitats?) tend to have 5-ranked (pentastichous) glumes (*F. friesii*), but is not constant within a plant and is difficult to assess. Further north (Malawi), this ranking has not been observed. (*F. stricta* extends to West Africa, Abyssinia [Ethiopia] and Madagascar).

In Natal, plants perennial wherever habitat conditions permit; favouring stream margins, often rooted in water, mostly in open, sunny grassveld situations. Flowering takes place throughout year, with a marked peak in April.

10. **Fuirena umbellata** *Rottb.*, Descriptionum et iconum rariores 1: 70 (1773); Vahl: 383 (1805); Kunth: 185 (1837); Boeck.: 646 (1869/70); Boeck.: 110 (1871–1873); Boeck.: 566 (1879); C.B. Clarke: 648 (1894b); Rendle: 129 (1899); C.B. Clarke: 466 (1901/02); Podlech: 25 (1967); P.L. Forbes: 122 (1980); R.W. Haines & Lye: 49 (1983). Type: Surinam, *Rolander s.n.* Figure 41B, D.

Scirpus umbellata (Rottb.) Kuntze: 337 (1898). *F. paniculata* L. f.: 105 (1781); Lam.: 566 (1783–1785); Lam.: 150 (1791); Poir.: 680 (1812). *S. fuirena* T. Koyama : 361 (1958).

F. oedipus C.B. Clarke: 478 (1906c); Gibbs: 189 (1908). Type: Rhodesia (Zimbabwe), Victoria Falls, *Gibbs 125*.

Note: for a full list of synonyms applicable to the taxon in Africa see P.L. Forbes: 123 (1980).

Icones: Rottb.: t. 19, fig. 3 (1773); C.B. Clarke: t. 59, fig. 9 (1909); P.L. Forbes: figs 20, 21 (1980); R.W. Haines & Lye: figs 55, 56 (1983); Vanden Berghen : figs 194, 195 (1988).

Vouchers: *Heard 2083; Tinley 255; C.J. Ward 5567, 9515.*

Description: P.L. Forbes: 123 (1980).

Distribution: North Coast (not known south of Stanger), Maputaland.

F. umbellata is pantropical in distribution and variable morphologically so that it has been known under many names. Its synonymy is complicated by confusion between *F. umbellata* and *F. ciliaris* (No. 1) [see Raynal & Roessler (1977), under *F. hildebrandtii*].

Plants known to respond markedly to habitat conditions, particularly the availability of water. Plants growing in permanent water are robust perennials with woody rhizome bearing contiguous, or almost so, emergent, 5-angled culms. Leaf sheaths also 5-angled; leaf blade with 5 strongly marked veins. These two criteria provide a simple means of identification. However, where water is temporary, or less freely available, plants often slender and small, and 5-angled culms and 5-veined leaf blades difficult to detect. In Natal, small plants may be sympatric with, or nearby, plants of *F. obcordata*. The two are readily confused until dissection reveals the presence of basal and apical hairs on scales of the Ihw. of *F. obcordata* (No. 6).

When plants of *F. umbellata* endure an unfavourable drying-out season in the growth cycle, the culm bases may become swollen, hard and corm-like. *F. oedipus* from the bog edge of the Victoria Falls rain forest (Gibbs 1908), was named for this. These corm-like swellings also occur among Natal plants (*Ward 5567; Getliffe 70*).

0468020 **ISOLEPIS**

Isolepis *R. Br.* Prodromus florae novae hollandiae et insulae Van-Diemen 1: 221 (1810); J. Raynal: 49 (1977b); R.W. Haines & Lye: 133 (1983). Type species: *Isolepis setacea* (L.) R. Br. (= *Scirpus setaceus* L.).

Scirpus section *Isolepis* (R. Br.) Griseb.: 417 (1845); T. Koyama: 284 (1958).

Eleogiton Link: 284 (1827). *Scirpus* section *Eleogiton* (Link) Rchb.: 38 (1846); T. Koyama: 283 (1985).

Note: at present there does not seem to be sufficient evidence to support the segregation of *Eleogiton* as a genus distinct from *Isolepis*. Wilson (1981), R.W. Haines & Lye (1983) and T. Koyama (1985) are followed in including it within *Isolepis*.

Key to species

Note: plants of *I. cernua* (No. 2), *I. sepulcralis* (No. 9) and *I. setacea* (No. 10) frequently look very similar in general facies. Detailed examination is necessary for accurate naming. The achenes of all three species are smooth, the surface eventually becoming minutely punctate or papillate.

1a Surface of mature achenes trabeculate (longitudinally ribbed with fainter transverse bars linking striations; epidermal pericarp cells wider than deep, placed in vertical rows) 2
1b Surface of mature achenes smooth or minutely papillate (epidermal pericarp cells isodiametric or approximately so, with or without a central projection) 6

2a Plants with leaves reduced to sheaths only; blades reduced to short outgrowths not longer than 5 mm 3
2b Plants with leaves (at least the majority) bearing photosynthetic blades usually much longer than 5 mm 4

3a Slender tufted perennial with erect, semi-erect or drooping culms 100–650 × 0.3–1.0 mm, that often lodge against the substrate or surrounding vegetation. Leaf sheaths often purplish or dark red towards base, mouths truncate, leaf blades reduced to oblong, blunt-tipped outgrowths 1–3(–5) mm long. Young inflorescences often appearing lateral rather than terminal, of 2–12(–16) sessile, rather short spikelets forming a head that is often proliferous .... 3. *I. costata*
3b Delicate erect to drooping annual or creeping perennial with slender inconspicuous rhizome linking tufts (plants variable in height from 10–150 mm). Leaf sheaths inconspicuous, greenish to pallid, occasionally purplish or brown at extreme base, mouths sloping; leaf blades reduced to short outgrowths, occasionally the uppermost of a shoot better developed. Inflorescence generally a solitary spikelet terminating the delicate culm (in robust examples a group of 2–3 sessile spikelets may form an apparently lateral head that is never proliferous) .... 10. *I. setacea*

4a Plants delicate, not obviously leafy nor perennial, either tufted with slender hair-like culms and narrow, rather soft leaf laminas more or less hidden among culms, or much reduced (not taller than 10 mm) with only the solitary spikelets conspicuous (from shallow water overlying mud); but when dissected out revealing slender creeping rhizomes from which adventitious roots develop (so possibly perennial). Mature achenes trigonous, almost round in outline, the surface coarsely trabeculate .... 10. *I. setacea*
4b Plants obviously perennial and leafy, either creeping with branching rhizomes, or tufted, the tufts connected by slender, often unbranched rhizomes. Mature achenes trigonous, but not markedly so, elliptic in outline, beaked, the surface finely or coarsely longitudinally striate 5

5a Inflorescences consisting of solitary spikelets (the most robust plants may bear a few small heads of 2–3 closely aggregated sessile spikelets). Glumes with flanks not conspicuously veined. Achenes *finely* trabeculate (summit plateau of the Drakensberg, E Cape and Lesotho only) .... 1. *I. angelica*
5b Inflorescences consisting of (2–)3(–9) closely aggregated sessile spikelets forming an apparently lateral head that is never proliferous. Glumes with flanks conspicuously veined. Achenes *coarsely* trabeculate .... 4. *I. diabolica*

6a Plants creeping, producing densely leafy tufts along prostrate stems immersed in water or extending across wet soil. Inflorescence a solitary, terminal, pedunculate, spikelet without an overtopping bract, accompanied by many other such inflorescences from axillary shoots so that spikelets appear numerous. (Note: variability is considerable depending upon microhabitat conditions: the range is from weak, small plants about 20 mm or less in height, to robust, carpet-forming masses up to 200 mm or more high. Glume colour grades from pale fawn to dark red. Under drier conditions plants grow erect and are tufted. These may occasionally produce inflorescences with an overtopping bract, but this may not be constant on a plant) ... 5. *I. fluitans*
6b Plants erect, tufted, leafy or leaves reduced to sheaths only, but never densely leafy and creeping as in the contrast. Inflorescence with at least one projecting bract longer than the spikelet(s) 7

7a Plants robust or tall for the genus. Leaves reduced to sheaths. Sheath mouth either truncate or sloping 8
7b Plants robust or slender and delicate, always leafy (leaf blades may be very fine and need to be carefully looked for) 9

8a Plants usually growing gregariously in locally exposed sandy moist areas of Coast, Midlands or Zululand (not Drakensberg). Culms erect or drooping, soft, not firm and wiry. Mouth to leaf sheath truncate. Inflorescence heads often proliferous, light brown, the spikelets sessile but individually discrete, the number countable .... 8. *I. prolifera*
8b Plants forming dense tussocks in mountain vleis. Culms firm and wiry. Leaf sheaths hard, dark brown, shining (visible when tussocks are parted); sheath mouth sloping not truncate. Inflorescence heads dark brown composed of numerous, congested, small spikelets .... 7. *I. pellocolea*

9a Plants leafy, erect, tufted, or with delicate rhizomes linking the tufts, bright green, darkening to greenish black to black on drying; culms coarse, soft, spongy, up to 2 mm in width. Achenes elliptic to ovate-elliptic, 0.3–0.5 mm wide, papillate. (In the field such plants are often accompanied by similar looking, but much less robust examples; occasionally gradients of robustness may be detected.) .... 6. *I. natans*
9b Plants with the growth form of *I. natans* but much less robust, sometimes less obviously leafy, pale to bright green, darkening on drying but not becoming black. Culms fine and delicate, never up to 2 mm in width, often hair-like. Achenes either narrowly elliptic, approximately twice as long as wide (*I. sepulcralis*), or almost round in outline, hardly longer than wide, often with one of the three ridges slightly asymmetrical basally, (*I. cernua*) 10

10a Mature achenes narrowly elliptic, approximately half as wide as long. Stamens 2 or 3 .... 9. *I. sepulcralis*
10b Mature achenes almost round in outline, usually with the abaxial ridge slightly asymmetric (projecting) in the basal half, only very slightly longer than wide. Stamens generally 3 .... 2. *I. cernua*

1. **Isolepis angelica** *B.L. Burtt* in Notes from the Royal Botanic Garden Edinburgh 43,3: 362 (1986); Hilliard: 59 (1987); Hilliard & B.L. Burtt: 115 (1987). Type: Lesotho, Sani Top, *Hilliard & B.L. Burtt 9666* (E, holo.; NU, iso.). Figure 42A, D.

Vouchers: Lesotho: *Guillarmod 4080; Hilliard & B.L. Burtt 9666; Killick 4103*. E Cape, Barkly East: *Hilliard & B.L. Burtt 14688*.

Description: B.L. Burtt: 362 (1986) protologue.

Distribution: not yet recorded for Natal, but should be looked for on the summit plateau of the Drakensberg.

Burtt's species includes only low-growing, sparsely leafy perennial plants (culms 5–40 mm high) bearing solitary dark reddish brown spikelets each overtopped by a short bract. Form abundant colonies in bare wet ground or grow together with short grasses in vlei land. Individual shoots and tufts interconnected by elongate, yellow rhizomes (stolons) that run horizontally, looping slightly between the shoots. These are slender, yet surprisingly robust in relation to the diminutive aerial organs.

Burtt drew attention to '... a few other specimens that have, on all except the smallest culms, a tight head of 2–3 spikelets', and cited as examples *Hilliard & B.L. Burtt 9682; Killick 4093; Guillarmod, Getliffe & Mzamane 162, 240; Hoener 1876.* He did not attempt to place these larger specimens, pending their further study. It is probable they represent the better grown expression of the species. A gathering from the Sani Pass plateau (*Browning 193*) includes a range from diminutive examples to taller plants with heads of sessile spikelets. Burtt's taxon is close indeed to *Isolepis diabolica* (= *Scirpus diabolicus* Steud.) (No. 4) which is represented in Natal by *Acocks 10739* PRE from the top of Griffin's Hill, Estcourt.

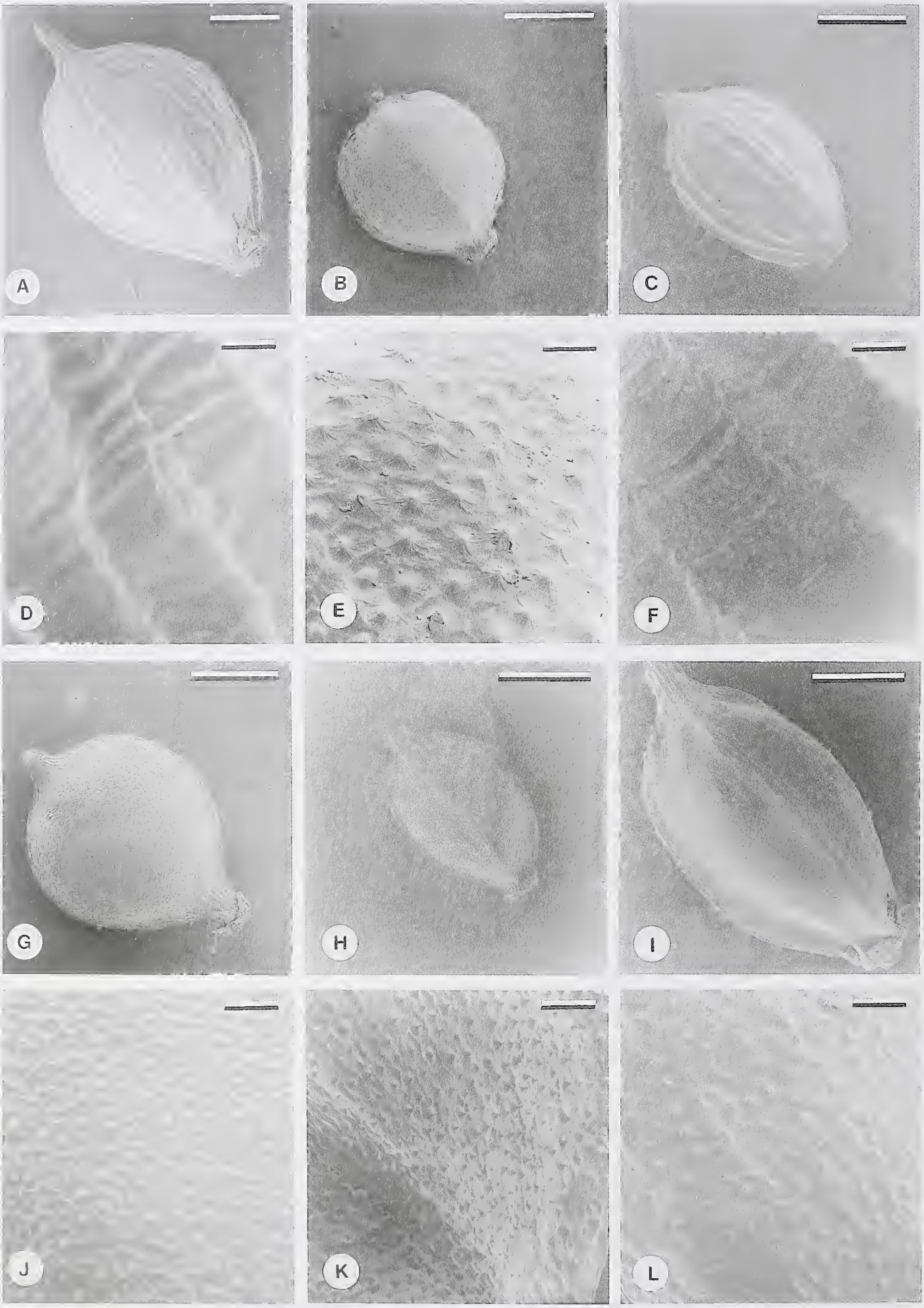

FIGURE 42.—*Isolepis*. A, D, *I. angelica, Killick 4103*; B, E, *I. cernua, J. Browning 241*; C, F, *I. costata, Hilliard & B.L. Burtt 13799*; G, J, *I. fluitans, Ward 3248*; H, K, *I. natans, Balkwill et al. 986*; I, L, *I. pellocolea, Hilliard & B.L. Burtt 15371*. Scale bars: A–C, G–I, 250 µm; D–F, J–L, 25 µm.

I. angelica also closely resembles *I. kilimanjarica* Lye & R.W. Haines (1974) (Type: Tanzania, Mt Kilimanjaro, *Hedberg 1348* UPS). The latter species is known only from the type locality and was fully described (but not named as it had been only once collected) in Hedberg's (1957) study of Afro-alpine vascular plants. Haines & Lye (1983) state that their species combines the characters of *I. setacea* (No. 5) (striate achene) and *I. fluitans* (No. 10) (runners, well-developed leaves and solitary spikelet). Both these taxa are present on the summit plateau of the Drakensberg and mountains of the eastern Cape Province. *I. angelica* may have arisen by such interspecific hybridisation. Distinction from *I. setacea* depends upon differences in shape and number of striations per face of the achene, and in the yellow rhizome of *I. angelica*, far more robust and stronger than rhizomes in *I. setacea*. It remains to investigate *I. angelica* in relation to both *I. diabolica* (not recorded for tropical Africa as far as is known) and the rare *I. kilimanjarica*.

2. **Isolepis cernua** *(Vahl) Roem. & Schult.*, Systema vegetabilium 2: 106 (1817); Hilliard: 59 (1987); Hilliard & B.L. Burtt: 115 (1987). Type: Lusitania (Portugal) *Rathke s.n.* (C?). Figure 42B, E.

Scirpus cernuus Vahl: 245 (1805); C.B. Clarke: 219 (1897/98); C.B. Clarke: 450 (1901/02); Podlech: 48 (1967); P.L. Forbes: 61 (1987b).

Vouchers: *J. Browning 241; C.J. Ward 1316.*

Description: C.B. Clarke: 219 (1897/98).

Distribution: Coast, Midlands, Zululand, N Natal.

Isolepis cernua has an almost cosmopolitan distribution (not known from tropical Africa and southeast Asia) and thus has many synonyms of which only the most familiar is cited here. Wilson (1981) remarks on the need for a world-wide study to establish limits that will effectively segregate the taxon from closely allied species.

In Natal, plants slender with delicate, fine culms that often lie prostrate on wet, otherwise bare substrate, or supported by water, if submerged. Grow in fresh water seeps verging on to coastal sand; on exposed alluvium along rivers and in moist, usually bare soil patches bordering rock pools up to altitudes of 2 600 m, probably more common at lower altitudes, but this needs further confirmation. Inflorescence is a solitary spikelet (occasionally 2, rarely more). Most reliable identification by characters of achene: almost round in outline, trigonous, abaxial ridge projecting slightly in lowest third, making basal portion slightly asymmetric; surface almost smooth to punctate. Confusion with *I. setacea* (No. 10) (achenes trabeculate) and with *I. sepulcralis* (No. 9) (achenes narrowly elliptic, approximately half as wide as long) is easily possible, if mature fruits are not considered.

3. **Isolepis costata** *Hochst. ex A. Rich.*, Tentamen florae abyssinicae 2: 499 (1851); R.W. Haines & Lye: 135 (1983); Hilliard: 59 (1987); Hilliard & B.L. Burtt: 115 (1987). Figure 42C, F.

Distribution: widespread.

I. costata is greatly in need of revision. Widely represented in Africa from Ethiopia to eastern Cape Province (as far as is known not represented in west tropical Africa, nor in Angola and Namibia, but this needs confirmation). Two varieties are recognised: var. *macra*, comprising smaller, more slender plants with shorter spikelets than typical variety. However, descriptions do not give adequate directives to the limitations of these infraspecific taxa and it is unclear whether both varieties are distributed throughout the continental range, or not. From the literature and superficial study of available specimens, it seems that tropical plants, despite often being placed with var. *costata*, are not more robust than many from Natal, (often placed with var. *macra*). In the eastern Cape, plants become much more robust with larger spikelets, the tendency to vegetative proliferation from the spikelets, that is such a well-marked feature of the species, also becomes less frequent. Whether these Cape plants belong within *I. costata* or whether they are more correctly placed with *I. diabolica* (No. 4) needs investigation. The enquiry should not be limited to Africa. Wilson (1981) has recorded *I. wakefieldiana* (S.T. Blake) K.L. Wilson for Australia. This species, with characters close to those of *I. costata*, is suspected of having arisen by hybridization. A specimen kindly donated by J.H. Ross (Melbourne) has revealed minor differences requiring further assessment.

In Natal, plants referable to *I. costata* are common wherever there are streambanks or oxygenated vlei margins with silted verges. Perennial and tufted (occasionally with delicate rhizomes linking tufts, often broken on removal from substrate) with a characteristic facies of slender (to very fine) flexible nodeless culms, each covered basally by a leaf sheath (sometimes purplish) with a truncate mouth and a reduced leaf blade forming a short apiculus (not exceeding 5 mm long). Inflorescence is a lateral, compact head of 10 or more, usually rather short spikelets overtopped by a bract. In fresh material, bract has conspicuous cream-coloured apical gland, but colour contrast is lost on drying. Inflorescences invariably show evidence of proliferation. Achenes have the trabeculate surface sculpturing that characterises the fruits of *I. setacea* (No. 10), *I. angelica* (No. 2) and *I. diabolica* (No. 4).

No attempt is made here to apply limits to var. *costata* and var. *macra*. Previous application of these categories was too arbitrarily undertaken. It is necessary to record changes in individual plants through their seasonal growth cycle, and also to clarify the range in morphological variability that possibly may be linked with habitat conditions, before attempting to differentiate at infraspecific level.

var. *costata*. Type: Ethiopia, without precise locality, *Schimper 1153* (K).

Scirpus costatus (A. Rich.) Boeck.: 511 (1869/70); C.B. Clarke: 620 (1894b); C.B. Clarke: 218 (1897/98); C.B. Clarke: 451 (1901/02); P.L. Forbes: 62 (1987b).

Description: C.B. Clarke: 218 (1897/98).

var. *macra* (Boeck.) B.L. Burtt: 363 (1986); Hilliard & B.L. Burtt: 115 (1987). Type: Madagascar, E. Imerina, Andrangoloaka, *Hildebrandt 3738*.

Scirpus macer Boeck.: 503 (1884); C.B. Clarke: 217 (1897/98); Schönland: 38 (1922). *S. costatus* (A. Rich.) Boeck. var. *macer* (Boeck.) Cherm.: 607 (1927).

Icones: Schönland: t. 36 (1922) as *Scirpus macer* (Note: mouths of leaf sheaths not accurately depicted); R.W. Haines & Lye: fig. 261 (1983) as *Isolepis costata.*

Vouchers: *Edwards 2192; Hilliard & B.L. Burtt 13799, 13974; Taylor 47, 65.*

Description: C.B. Clarke: 217 (1897/98).

4. **Isolepis diabolica** *(Steud.) Schrad.*, Analecta ad floram capensem: 21 (1832b). Type: South Africa, Cape Division, marshy places at the foot of Devil's Mountain, *Ecklon 871*.

Scirpus diabolicus Steud.: 147 (1829); Boeck.: 505 (1869/70); C.B. Clarke: 621 (1894b); C.B. Clarke: 217 (1897/98); Levyns: 105 (1950).

Isolepis antarctica Nees: 505 (1832); Nees: 83 (1833); Nees: 162 (1835). *Ficinia antarctica* Nees: 292 (1834b) non Drège: 249 (1847); Kunth: 255 (1837).

Ficinia schinziana Boeck.: 47 (1887).

Voucher: *Acocks 10739* (PRE).

Description: C.B. Clarke: 217 (1897/98).

Distribution: Midlands, but alt. above 1 500 m.

Plants perennial, up to 360 mm in height (perhaps taller when species fully known?); shoots connected by yellowish horizontal stolons similar to those of *I. angelica* (No. 1). Leaf blades, usually shorter than culms, are developed from sheaths with truncate mouths and no ligule. Inflorescence a lateral head overtopped by a long bract that continues in the line of the culm until the 3–9 sessile spikelets reach maturity, when it recurves. Glumes deep reddish black, colourless basally, flanks conspicuously longitudinally veined, margin a narrow translucent, membranous line, apex (at least of upper glumes) minutely mucronate. Achenes are trabeculate with beaked apex.

This species is best known in the Cape Peninsula from where it appears to be distributed, in damp streamside situations at increasing altitudes, through the eastern mountainous zone into Natal. More knowledge of its distributional pattern and habitat preferences are needed. It does not favour alpine situations, otherwise it would surely have been recorded from the southern Drakensberg or Lesotho! Perhaps its apparent absence (or rarity) is a case of misidentification (placed with *I. costata*?). Relationship with *I. angelica* is very close, notwithstanding the size discrepancy (if *I. angelica* is restricted to the limits imposed by Burtt 1986). What of the unplaced, larger plants? (see No. 1). There certainly are qualitative differences between *Acocks 10739* and diminutive examples of *I. angelica* (*Hilliard & B.L. Burtt 9666*, type), namely, the glumes in the latter do not have the flanks strongly marked by longitudinal veins; the marginal translucent line is not so obvious; the anther crests are not identical. Subsequent study should prove interesting.

5. **Isolepis fluitans** *(L.) R. Br.*, Prodromus florae novae hollandiae et insulae Van Diemen 1: 221 (1810); Kunth: 188 (1837); A. Rich.: 498 (1851); R.W. Haines & Lye: 138 (1983); Hilliard: 58 (1987); Hilliard & B.L. Burtt: 115 (1987). Type: from Europe (England?). Figure 42G, J.

Scirpus fluitans L.: 48 (1753); C.B. Clarke: 621 (1894b): C.B. Clarke: 213 (1897/98); C.B. Clarke: 449 (1901/02); P.L. Forbes: 62 (1987b). *Eleogiton fluitans* (L.) Link: 285 (1827).

Eleogiton fascicularis Nees: 165 (1835). *Isolepis fascicularis* (Nees) Kunth: 188 (1837).

Icones: R.W. Haines & Lye: figs 267–269 (1983); Davis in Hilliard: 58 (1987).

Vouchers: *K.D. Huntley 420; Hilliard & B.L. Burtt 14109; C.J. Ward 3248.*

Description: C.B. Clarke: 213 (1897/98).

Distribution: widespread.

Distributed throughout the Old World, from Europe to Australia: absent from the Americas. Re-assessment of its variability is much needed (Haines & Lye 1983). Typical form aquatic, perennial, with elongate leafy stems terminated by bare, relatively short culms carrying solitary spikelets each hardly, or not, overtopped by involucral bract. These features resulted in placement of the species in *Eleogiton* Link. Wilson (1981) found that, in Australia, the typical aquatic form graded into a terrestial state with tufted culms, a leaf-like involucral bract and sessile spikelets, sometimes within an individual plant. This variation paralleled seasonal variation described by Levyns (1944) in the South African species, *I. rubicunda* (Nees) Kunth. Wilson (1981) therefore regarded *Eleogiton* as no more than an aquatic specialisation of *Isolepis* and did not maintain the two genera as distinct. This interpretation is followed here.

I. fluitans is very commonly represented in Natal, growing particularly in vleis and drainage canals and ditches, rooted on muddy tussocks and extending into softly flowing water. Plants show wide variability in size, robustness, extent of branching, leafiness, culm development and glume coloration (pallid fawn to dark purplish red). Because of the range of form, identification is sometimes not obvious, but consideration of the features mentioned above should lead to an accurate determination. In its most diminutive expression, *I. fluitans* can be mistaken for *I. angelica* and *I. setacea*, but the achenes are not trabeculate and the style arms are two not three.

6. **Isolepis natans** *(Thunb.) D. Dietr.*, Synopsis plantarum 1: 106 (1839); J. Raynal: 56 (1977b); R.W. Haines & Lye: 141 (1983). Type: South Africa, Cap. b. spei. *Thunberg 1633* (UPS). Figure 42H, K.

Scirpus natans Thunb.: 17 (1794); Thunb.: 361 (1811).

Isolepis rivularis Schrad.: 19 (1832b); Kunth: 194 (1837). *Scirpus rivularis* (Schrad.) Boeck.: 504 (1869/70); C.B. Clarke: 629 (1894b); C.B. Clarke: 220 (1897/98).

I. palustris Schrad.: 17 (1832b).

I. pallida Nees: 81 (1833).

Icones: Schrad.: t. 1, fig. 5 (1832b) as *I. rivularis*; Schrad.: t. 1, fig. 7 (1832b) as *I. palustris*; R.W. Haines & Lye; fig. 274 (1983).

Vouchers: *Balkwill et al. 986; K.D. Huntley 225; Smook 541.*

Description: C.B. Clarke: 220 (1897/98) as *Scirpus rivularis.*

Distribution: Coast, Midlands, N Natal, S Natal (Weza).

Haines & Lye (1983) described plants of *I. natans* as 'slender, leafy, glabrous, perennial'. In Natal, it is possible that under favourable conditions, they may endure for more than one growing season, but the rootstock is weakly developed, and it seems more accurate to regard them as short-lived, propagating from seed rather than by persis-tent underground organs. Short, erect, tufted, leafy, bright green, almost succulent plants are conspicuous against bare alluvium along streamlets or in pools among rocks. Dried, they darken to blackish green or black, a feature that distinguishes the species from *I. cernua* (No. 2) and *I. sepulcralis* (No. 9). In the field, robust plants, darkening on drying (*I. natans*), not uncommonly grow in close association and form gradients with others ranging to slender delicate examples with hair-like culms. The most fragile are erect in water, but without its support, lodge on the substrate. These are generally named *I. cernua* (probably correctly), but detailed study, including the propagation of fruits from separate individuals, is needed to elucidate the variability represented. Mature achenes of *I. natans* are not distinguishable from those of *I. sepulcralis.*

7. **Isolepis pellocolea** *B.L. Burtt* in Notes from the Royal Botanic Garden Edinburgh 43: 363 (1986); Hilliard: 59 (1987); Hilliard & B.L. Burtt: 115 (1987). Type: South Africa, Natal, Underberg Dist., vicinity of Tarn Cave, above Bushman's Nek, *Hilliard & B.L. Burtt 17468* (E, holo., NU, iso.). Figure 42I, L.

Vouchers: *Hilliard & B.L. Burtt 13677, 15371, 17468.*

Description: B.L. Burtt: 363 (1986) protologue.

Distribution: Uplands, Underberg Dist. only.

I. pellocolea takes its name from the dark brown shining leaf sheaths that become conspicuous when tufts, deeply rooted in 'closed marsh', which is given as the favoured habitat, are parted. These dark shining sheaths may result from anaerobic conditions pertaining in the dense, damp tussocks of the vlei. Burtt (1986) drew attention to the similarity in general facies between his species and the locally abundant *I. costata* (No. 3), which differs, however, in the sloping (not truncate) sheath mouths, the differently shaped reduced leaf blades and the smooth-surfaced achenes (trabeculate in *I. costata*). Because of the smooth achenes, Burtt found *I. pellocolea* to have affinity with *I. prolifera* (No. 8), which, however, is not an upland species. He named *Scirpus ficinioides* Kunth (*Hilliard & B.L. Burtt 17467*) as growing in the same vlei with the type specimen of *I. pellocolea.* Careful comparison of plants of *I. costata, Scirpus ficinioides* and *I. pellocolea*, suggests the last species is the outcome of intergeneric hybridisation between the other two taxa, followed perhaps, by backcrossing and stabilisation. *I. pellocolea* appears to have limited distribution; as yet only in association with its putative parents. In proposing a possible hybrid origin for *I. pellocolea*, it is relevant that *Isolepis* has been treated as a section within *Scirpus sensu lato.* Other interpretations are needed.

8. **Isolepis prolifera** *(Rottb.) R. Br.*, Prodromus florae novae hollandiae et insulae Van Diemen 1: 223 (1810); Nees: 294 (1828); Nees: 493 (1832); Nees: 158 (1835); Kunth: 201 (1837). Type: Cap. b. spei. (?). Figures 43; 44A, D.

Scirpus prolifer Rottb.: 55 (1773); Boeck.: 692 (1869/70); C.B. Clarke: 629 (1894b); C.B. Clarke: 226 (1897/98).

Cyperus punctatus Lam.: 144 (1791).

C. prolifer Thunb.: 18 (1794) p.p.; Thunb.: 374 (1811); Steud.: 150 (1829) p.p.

Icones: Rottb.: t. 17, fig. 2 (1773) as *Scirpus prolifer.*

Vouchers: *J. Browning 215, 225; K.D. Huntley 712; R. l'Ons 42/81; 12/83; Wells 1076.*

Description: C.B. Clarke: 226 (1897/98) as *Scirpus prolifer.*

Distribution: Coast, Midlands, Zululand.

Note: *Isolepis prolifera* (= *Scirpus prolifer*) must not be confused with *S. subprolifer* Boeck. (1869/70) which is said to be similar to *I. cernua* (Vahl) Roem. & Schult., but which is probably very closely related to *I. sepulcralis* No. 9). (= *Scirpus chlorostachyus* auct. non Levyns 1950).

Plants variable in degree of robustness, but coarser than most other Natal representatives of genus. Often grow gregariously, colonising bare sands or sandy alluvium where there is some accumulation of fresh water (sometimes temporarily bare depressions in coastal grassveld). Best recognised by absence of leaves (reduced to sheaths), inflorescences (pseudo-lateral to terminal heads of diverging light brown, fawn or greenish brown spikelets, few enough to be counted and frequently proliferating). Achenes (not always present) smooth under low magnification, but with a reticulation of small isodiametric cells under electron scanning that, as far as has been determined, never develop a central papilla.

Wilson (1981) remarked that the natural affinity of the species may not be with *Isolepis* but rather with *Scirpoides* Ség. or in a genus of its own.

9. **Isolepis sepulcralis** *Steud.*, Synopsis plantarum glumacearum 2: 94 (1855); J. Raynal: 51 (1977b); R.W. Haines & Lye: 140 (1983). Type: Saint Helene, *Dumont d'Urville 69a* (P, holo. and iso.). Figure 44B, E.

Fimbristylis exigua Boeck.: 506 (1884). Type: Madagascar, *Hildebrandt 3739* (P, iso.).

Scirpus griquensium C.B. Clarke: 623 (1894b) name only; C.B. Clarke: 222 (1897/98) description. Type: South Africa, Griqualand East (Transkei), streams near Clydesdale, *Tyson 2861* (K).

S. chlorostachyus auct. non Levyns: 105 (1950).

S. cernuus auct. non Vahl

Icones: R.W. Haines & Lye: figs 272, 273 (1983).

Vouchers: *Morris 1023; Moll 1076; C.J. Ward 633.*

Description: C.B. Clarke: 222 (1897/98) as *Scirpus griquensium.*

Distribution: Coast, Midlands, N Natal, Zululand.

I. sepulcralis takes its name from the type locality (Napoleon's tomb). In Natal, plants erect, slender, tufted, glabrous annuals (?) (weakly developed rootstock links the shoots; it seems ineffectual as an organ of perennation), growing on alluvium along streamlets and verging isolated pools. Examination of mature achenes is essential to distinguish *I. sepulcralis* from the similar, but usually more slender *I. cernua* (No. 2). Plants of *I. natans* (No. 6) are slightly coarser than those of both the other taxa.

A brief summary of differences follows:

I. sepulcralis: glumes 0.5–1.2 mm long. Achenes trigonous, the three ridges all sloping symmetrically and gradually to the base; narrowly elliptic in outline, approximately twice as long

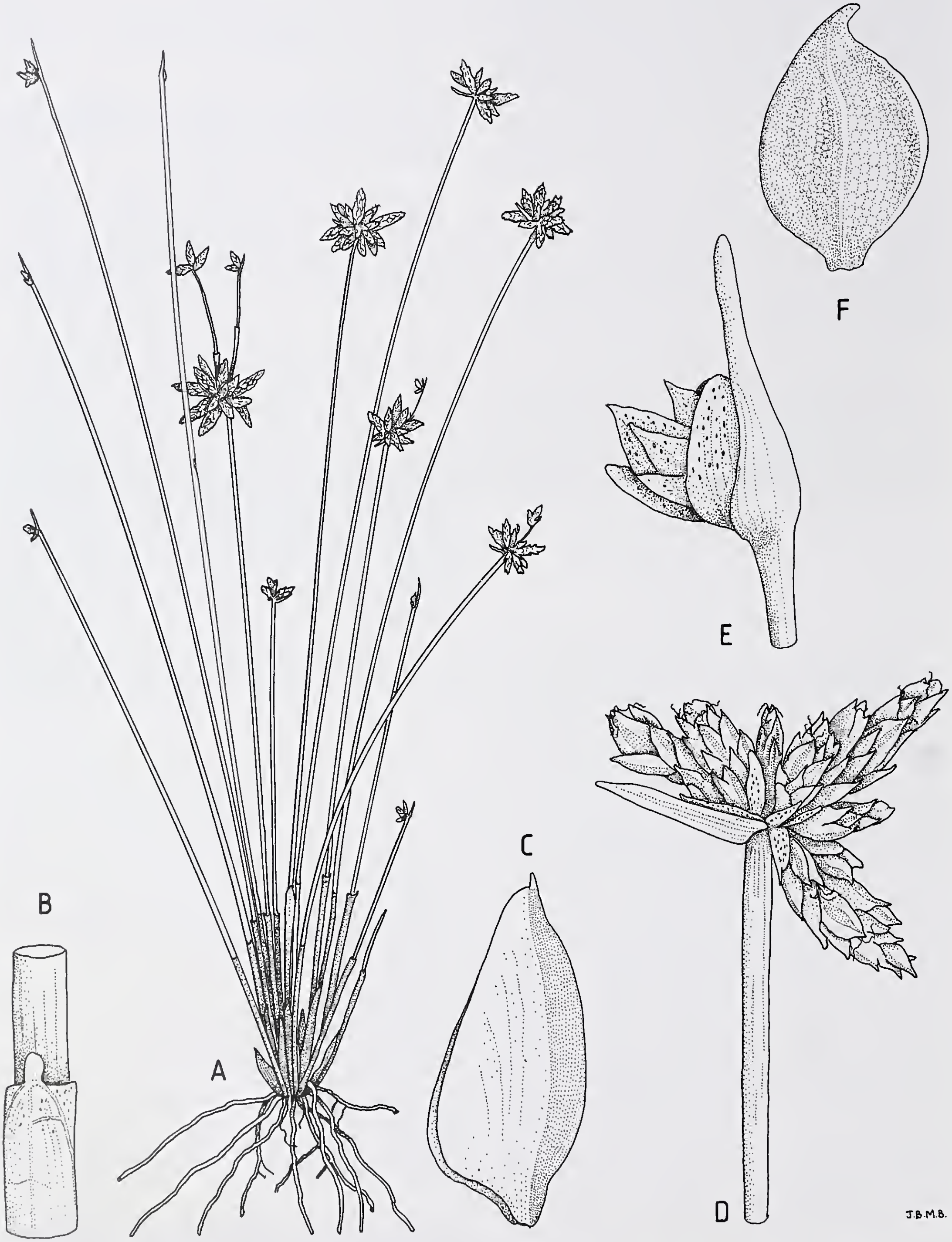

FIGURE 43.—*Isolepis prolifera, J. Browning 225.* A, plant, × 1; B, apex of leaf sheath, × 12; C, glume, lateral view, × 24; D, mature inflorescence, × 5; E, young developing inflorescence, × 12; F, achene, × 53.

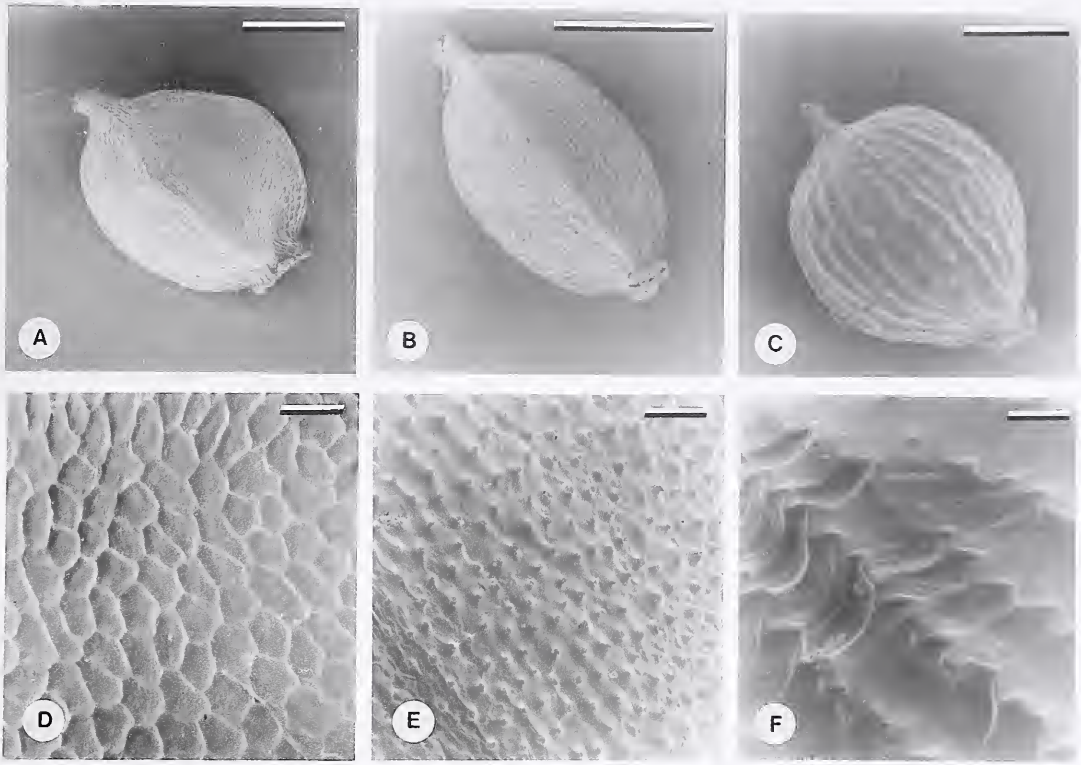

FIGURE 44.—*Isolepis*. A, D, *I. prolifera*, *J. Browning 215*; B, E, *I. sepulcralis*, *Moll 1076*; C, F, *I. setacea*, *Schwabe D092*. Scale bars: A–C, 250 µm; D–F, 25 µm.

as wide; surface minutely papillate at full maturity, apex slightly beaked.

I. cernua: glumes 1.0–1.5 mm long. Achenes trigonous, abaxial ridge projecting slightly near its base to make it asymmetric compared with the two gradually sloping lateral ridges; almost round in outline, scarcely longer than wide; surface smooth, becoming minutely papillate at full maturity.

I. natans: glumes 1.5–2.0 mm long. Achenes as for *I. sepulcralis*. Plants blackening on drying.

10. **Isolepis setacea** *(L.) R. Br.*, Prodromus florae novae hollandiae et insulae Van Diemen 1: 222 (1810); Kunth: 193 (1837); R.W. Haines & Lye: 134 (1983); Hilliard: 58 (1987); Hilliard & B.L. Burtt: 115 (1987). Type: from Europe. Figure 44C, F.

Scirpus setaceus L.: 49 (1753); C.B. Clarke: 630 (1894b); C.B. Clarke: 217 (1897/98); C.B. Clarke: 450 (1901/02); Schönland: 38 (1922); Podlech: 51 (1967); P.L. Forbes: 63 (1987b).

Isolepis plebeia var. β *major* Schrad.: 18 (1832b); Nees: 82 (1833); Nees: 153 p.p. (1835).

Icones: Schrad.: t. 1, fig. 6 (1832b); Nees: t. 3, fig. 2a (1833); Schönland: t. 35 (1922); R.W. Haines & Lye: figs 258, 259 (1983).

Vouchers: *Hilliard & B.L. Burtt 15550; Pentz & Acocks 10263* (PRE); *Schwabe D092*.

Description: C.B. Clarke: 217 (1897/98) as *Scirpus setaceus*.

Distribution: N Natal, Uplands.

Plants variable in facies. They may be slender, glabrous, sparsely tufted, with hair-like culms, supported by water or lodged on damp substrate [appearing similar to slender plants of *I. cernua* (No. 2)]; or they may be shorter and more branched and creeping with a slender rhizome that roots at intervals (not easily observed amongst slender branches). At highest altitudes often diminutive (± 10 mm), with only tips of leaves and short culms bearing solitary spikelets exposed above wet mud. Occasionally such diminutive specimens float in shallow pools in rock depressions. Superficially there is resemblance to *I. angelica* (No. 1), but trabeculations on that achene surface finer and that achene slightly longer in relation to its width and more markedly beaked. *I. setacea* differs from *I. cernua* and *I. sepulcralis* (No. 9) in the sculpturing of the achene (trabeculate in the first; minutely papillate in the other two). In Natal, *I. setacea* is commoner at high altitudes than either *I. cernua* or *I. sepulcralis*, but this must not be considered diagnostic. Dissection of individual plants is essential if identification is to be accurate.

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Kyllinga *Rottb.* nom. conserv., Descriptionum et iconum rariores: 12 (1773) p.p.; C.B. Clarke: 151 (1897/98); C.B. Clarke: 266 (1901/02); Schönland: 19 (1922); Podlech: 29 (1967); R.A. Dyer: 883 (1976); Getliffe: 261 (1983). Type species: *K. nemoralis* (J.R. & G. Forst.) Dandy ex Hutch. & Dalziel, type conserved.

Key to species

1a Inflorescence dark reddish brown .... 12. *K. pulchella*
1b Inflorescence variously coloured; white to off-white (occasionally faintly reddish or brownish tinged); green, greenish yellow to golden; never dark reddish brown 2

2a Inflorescence of few (usually 6–20) spikelets; at least some of the inflorescences proliferous .... 10. *K. pauciflora*
2b Inflorescence of many (nearly always exceeding 20) spikelets; proliferous inflorescences unknown, except occasionally in *K. nemoralis* 3

3a Plants producing fleshy white stolons that may radiate in all directions from the main plant and terminate in lateral plants (Note: if the stolons have been broken on removal from soil, the laterals may appear as separate plants on herbarium sheets: necessary to look for remnants of stolons). Spikelet producing 1 achene only. Glumes winged, spinulose. Coast .... 8. *K. nemoralis*
3b Plants without radiating stolons, EITHER tufted, with or without swollen stem bases, OR with an evident rhizome that may be irregular and clumped, or uniseriate and contracted or elongate, OR differing otherwise from *K. nemoralis* 4

4a Rhizome coarse, woody, uniseriate, usually closely enveloped in persistent leaf bases. Culms pubescent below the golden green inflorescence. Glumes usually markedly winged .... 1. *K. alata*
4b Plants differing from *K. alata* 5

5a Plants tufted, the rhizome either merely connecting the shoots OR forming a short row or mass of stem bases that may be slightly swollen and are usually covered in dark, tough fibrous leaf sheaths 6
5b Plants with an evident rhizome that is EITHER irregular and clumped, OR uniseriate and contracted or elongate; leaf sheaths not dark, tough and fibrous 7

6a Inflorescence cylindrical, greenish when young, clear white at maturity. Glume keels wingless. Plants tufted, the rhizome merely connecting the shoots. Widespread, often a weed or ruderal .... 9. *K. odorata*
6b Inflorescence subglobose, white to off-white (sometimes dotted cinnamon-brown in age). Glume keels variable, sometimes markedly winged. Rhizome usually connecting a short irregular row or mass of sometimes swollen stem bases clothed in dark, fibrous leaf sheaths. Dry situations in Maputaland and Zululand .... 2. *K. alba*

7a Stamen 1 per floret. Inflorescence of 1 (rarely 2–3) globose to oval, greenish white to pale yellow spike(s). Rhizome elongate, slender, white with pinkish or pale brown, membranous, striate scale leaves. Weed of cultivation, not known from undisturbed natural vegetation .... 3. *K. brevifolia*
7b Stamens 3 per floret. Inflorescences and rhizomes not precisely as for *K. brevifolia* 8

8a Rhizomes elongate, often uniseriate, bearing culms at intervals of 3–22 mm (usually exceeding 10 mm except at growing apex) 9
8b Rhizomes more contracted, EITHER irregular and clumped, OR uniseriate bearing culms that are contiguous or almost so (an occasional wider interval may occur, but these are never in the majority) 10

9a Inflorescence of 1–3 spikes, the central cylindrical or elliptic. Bracts long (up to 290 mm), horizontally orientated. Lower culm leaves reduced to sheaths, the upper with short blades. Culm triquetrous. Rhizome soft, pliable, 2–3 mm in diameter with transparent, membranous, striate scale leaves .... 4. *K. elatior*
9b Inflorescence of 1 globose to ovate spike. Bracts 2–3, lowest erect at first, later reflexing. Leaf blades usually reasonably well developed. Rhizome firm, succulent, 1–2 mm in diameter with reddish brown, obtuse scales leaves. (Plants closely resembling *K. erecta*, but with culms more widely spaced, and mucros of glumes shorter by 0.1–0.2 mm. Not common in Natal, more frequent in tropical Africa) .... 6. *K. intricata*

10a Inflorescence of 1 globose, golden or greenish yellow spike. Plants usually under 400 mm in height (generally much less, but occasional plants can be very tall). Rhizome firm, succulent, shrinking with drying so that the brown or reddish obtuse scale leaves become loose .... 5. *K. erecta*
10b Inflorescence of EITHER 1, subglobose to ovoid-cylindric greenish yellow spike subtended by 3 (or 3 + 1) stiff, rather short bracts, erect at first later reflexing; OR of a group of ovoid or globose heads (always more than 1). Plants (both alternatives) generally 300–640 mm tall 11

11a Inflorescence of 1 subglobose to ovoid-cylindric (occasionally globose) greenish yellow (sometimes red-streaked) spike. Bracts 3 (or 3 + 1, the additional much shorter), stiff, erect at first, later reflexing. Rhizome with culms always contiguous. Plants forming conspicuous tufts along streambanks. Widespread .... 7. *K. melanosperma*
11b Inflorescence usually of more than 1 sessile, globose, green spike. Bracts 3–8, spreading, 13–21 mm long. Plants otherwise resembling *K. melanosperma*, but known from the coast (Durban) only .... 11. *K. polyphylla*

Note: alternative names for *Kyllinga* species (synonyms not included) are given in Table 2.

Cyperus L. subgen. *Kyllinga* (Rottb.) J.V. Suringar: 42 (1898); Kük.: 566 (1936); R.W. Haines & Lye: 224 (1983).

Kyllingia auctt.

1. **Kyllinga alata** *Nees* in Linnaea 9: 286 (1834b) nom. nud.; Nees: 139 (1835) description; Podlech: 30 (1967); Getliffe: 280 (1983). Type: Cape, locis humidis arenosis ad 'Koegakammaklog' et flumen Zwartkopsrivier alt. II, *Ecklon 883* (S, iso.?). Figure 45A–C.

K. alba Nees var. *alata* (Nees) C.B. Clarke: 526 (1894b); C.B. Clarke: 151 (1897/98); C.B. Clarke: 272 (1901/02); Schönland: 19 (1922). *Cyperus alatus* (Nees) F. Muell.: 272 (1874); Kük.: 611 (1936); R.W. Haines & Lye: 249 (1983).

K. aurea Hochst.: 757 (1845) nom. nud.

Icones: Schönland: t. 1 (1922); Getliffe: fig. 9 (1983); R.W. Haines & Lye: figs 500, 501 (1983).

Vouchers: *Getliffe 169; Moll 1475; Strey 5529; Ward 2776, 4980.*

Description: Getliffe: 280 (1983).

Distribution: Coast, Midlands, Maputaland.

Often regarded as closely allied to *K. alba* (No. 2), but readily distinguishable from that species. Nees established both *K. alata* (culms pubescent below inflorescence;

TABLE 2.—Alternative names for *Kyllinga* species (synonyms not included)

Kyllinga	*Cyperus*
alata Nees	*alatus* (Nees) F. Muell.
alba Nees	*cristatus* (Kunth) Mattf. & Kük.
brevifolia Rottb.	*brevifolius* (Rottb.) Hassk.
elatior Kunth	*pinguis* (C.B. Clarke) Mattf. & Kük.
erecta Schumach.	*erectus* (Schumach.) Mattf. & Kük.
intricata Cherm.	*brevifolius* (Rottb.) Hassk. subsp. *intricatus* (Cherm.) Lye
melanosperma Nees	*melanospermus* (Nees) J.V. Suringar
nemoralis (J.R. & G. Forst.) Dandy	*kyllingia* Endl.
odorata Vahl	*sesquiflorus* (Torr.) Mattf. & Kük. subsp. *sesquiflorus*
pauciflora Ridl.	*ridleyi* Mattf. & Kük.
polyphylla Willd. ex Kunth	*aromaticus* (Ridl.) Mattf. & Kük.
pulchella Kunth	*teneristolon* Mattf. & Kük.

glumes golden with mucros often recurved) and *K. alba* (culms glabrous, occasionally scabrid; glumes pale with straight mucros). Clarke reduced the former to varietal status, but recent workers all accept that the morphological differences between them require specific ranking for both.

In Natal, *K. alata* usually occurs in vlei or semi-vlei depressions in grassland and has a wider distribution than *K. alba* which is limited to much drier terrain only in Zululand and Maputaland. The coarse uniseriate rhizome and the golden to greenish yellow winged glumes are the most striking features of *K. alata.*

2. **Kyllinga alba** *Nees* in Linnaea 10: 140 (1835); C.B. Clarke: 526 (1894b); C.B. Clarke: 151 (1897/98); C.B. Clarke: 271 (1901/02); Schönland: 19 (1922); Podlech: 30 (1967); Getliffe: 284 (1983). Type: South Africa, Cape, in utroque latere fluminis 'der zwarte Keyrivier' dicti alt. III *Ecklon* (S?, holo.). Figure 45D–F.

K. cristata Kunth: 136 (1837). *Cyperus cristatus* (Kunth) Mattf. & Kük.: 609 (1936); R.W. Haines & Lye: 248 (1983). Syntypes: Cape, Queenstown Dist., *Drège 3930, 7385.*

K. cristata Kunth var. *exalatus* Merxm.: 75 (1951). *Cyperus cristatus* (Kunth) Mattf. & Kük. var. *exalatus* Merxm.: 80 (1951). *K. alba* Nees var. *exalata* (Merxm.) Podlech: 525 (1960). Type: Rhodesia, Marandellas, *Dehn 804.*

K. nigritana C.B. Clarke: 272 (1901/02). *Cyperus cristatus* (Kunth) Mattf. & Kük. var. *nigritanus* (C.B. Clarke) Kük.: 610 (1936). *K. alba* Nees var. *nigritana* (C.B. Clarke) Podlech: 525 (1960). Type: Nigeria, Sümpfe bei Nupe, *Barter 1588* (K, holo.).

Icones: Getliffe: fig. 11 (1983); R.W. Haines & Lye: fig. 499 (1983).

Vouchers: *Getliffe 178; Ross 675, 685, 693; Ward 1656.*

Description: Getliffe: 284 (1983).

Distribution: Zululand, Maputaland.

K. alba is a species of drier situations than the allied *K. alata* (No. 1). It is also more variable, especially in tropical Africa where it is well represented. In Natal, plants favour sandy soil amongst grasses in open scrub/thicket or rocky situations on the Lebombo Mountains. There are no records from the coast. In the literature, records exist for Coast and Midlands. These apply to *K. alata*, which, for years was classified as a variety of *K. alba*. (All specimens not from dry situations in Zululand and Maputaland should be carefully checked for authenticity). *K. alba* is best recognised by its fairly large, subglobose white head, sometimes spotted cinnamon-brown in adverse microhabitats or with age, and the clustered, often slightly swollen stem bases with dark persistent leaf sheaths. Glumes variable in width of wing tissue developed from keel (wing may be absent or up to 1 mm wide and smooth-margined or toothed; *not* reliable in identification).

Clarke (1897/98) established *K. buchanani* (non *Cyperus buchanani* Boeck.) on a specimen from Natal (*Mudd s.n.* Umzula) segregating it from *K. alba* on the wingless glume. Kükenthal (1936) recorded Clarke's species as *Cyperus sublaevicarinatus* Mattf. & Kük. *nom. nov.* stating that Mudd's specimen had not been seen. It has still not been located. It seems probable Clarke's species represents '...an extreme state of *K. alba*', as Clarke himself suggested. Mudd collected on the Lebombo Mts where *K. alba* is known to occur.

3. **Kyllinga brevifolia** *Rottb.*, Descriptionum et iconum rariores 13, t. 4, fig. 3 (1773); C.B. Clarke: 527 (1894b); C.B. Clarke: 273 (1901/02); Getliffe: 287 (1983). Type: India, *Koenig* (BM, holo.; STB, iso.). Figure 45G–I.

Cyperus brevifolius (Rottb.) Hassk.: 24 (1844); Kük.: 600 (1936); R.W. Haines & Lye: 236 (1983) (subsp. *brevifolius* only).

Schoenus coloratus L.: 64 (1762) p.p. *Kyllinga colorata* (L.) Druce: 630 (1917). Type: LINN., collector uncertain.

Icones: C.B. Clarke: t. 1, figs 1–4 (1909); Getliffe: fig. 12 (1983).

Vouchers: *Getliffe 23, 191, 228, 976, 1003, 1007; Ross 357, 358, 1266, 1267.*

Description: Getliffe: 289 (1983).

Distribution: Coast, Midlands.

In Natal, *K. brevifolia* appears to be adventive, occurring as a weed in shaded, damp, disturbed areas where it may form almost pure stands. Frequent in lawns and there variable in height depending upon degree of shade and frequency of mowing. Does not seem to escape into undisturbed natural vegetation. Closely related to *K. erecta* and *K. intricata* (Nos 5 & 6), but *K. brevifolia* is more delicate with a more slender rhizome that bears culms at wide intervals as in *K. intricata*. (Getliffe remarks that the rhizome lacks the striking red-brown scales of *K. intricata*, but the colour of these organs depends somewhat on degree of exposure to light). Differences also in inflorescence (a greenish white to pale yellow, ovoid to elliptic spike in *K. brevifolia*; a greenish yellow to golden, globose to ovoid spike in *K. erecta* and *K. intricata*). The safest means of identification is the solitary stamen per floret in *K. brevifolia*; three per floret in the other two. Literature references do not bear out this distinction (probably because of early confusion of specimens within the species) but it seems to hold for plants in Natal. Asian plants often have 1–2 stamens per floret.

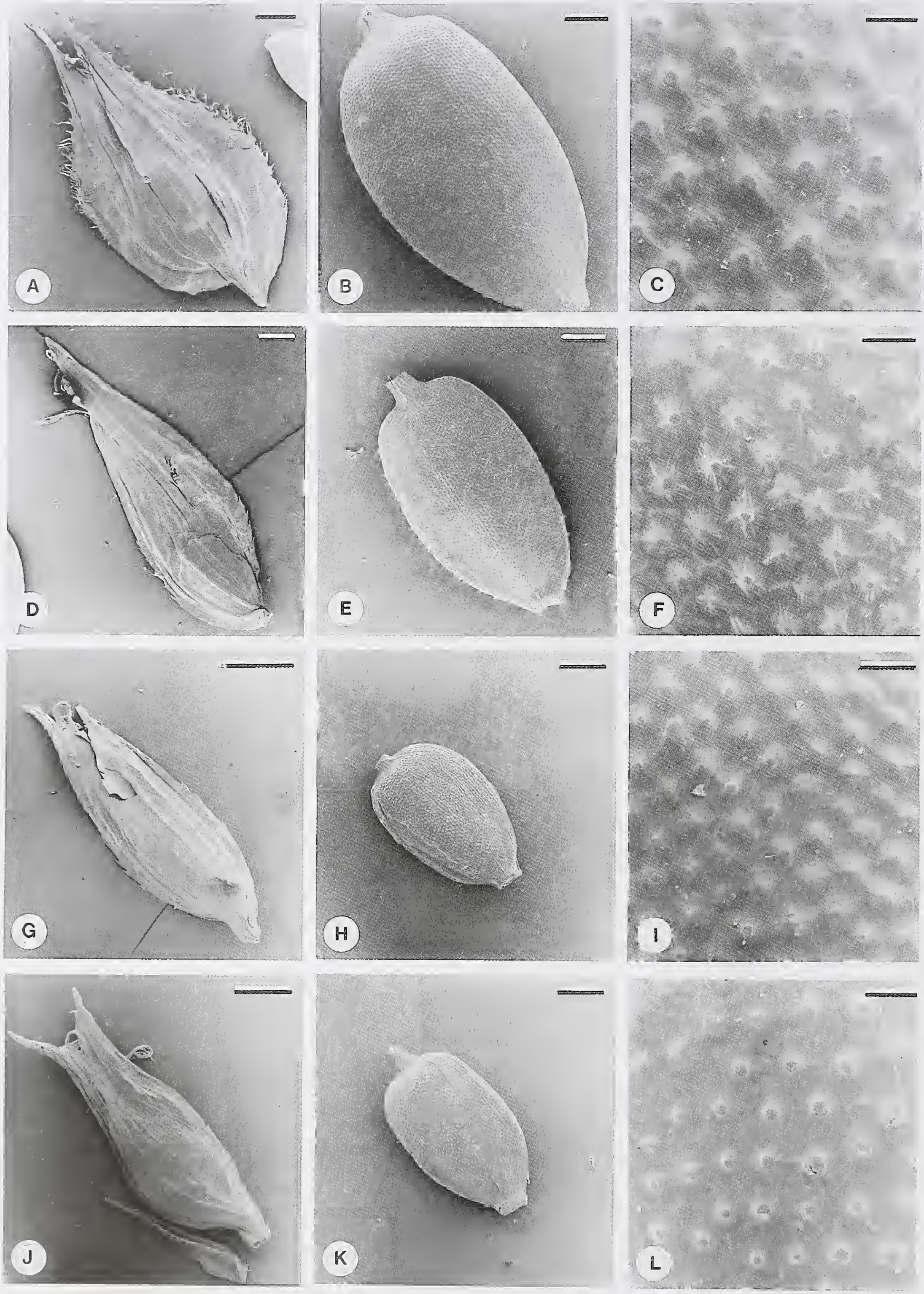

FIGURE 45.—*Kyllinga*. A–C, *K. alata*, *Strey 5529* ; D–F, *K. alba*, *Ross 693*; G–I, *K. brevifolia*, *Getliffe 191*; J–L, *K. elatior*, *Frankish 190*. Scale bars: A, D, G, J, 500 μm; B, E, H, K, 250 μm; C, F, I, L, 25 μm.

4. **Kyllinga elatior** *Kunth*, Enumeratio plantarum 2: 135 (1837); C.B. Clarke: 528 (1894b); C.B. Clarke: 153 (1897/98); C.B. Clarke: 275 (1901/02); Getliffe: 290 (1983). Type: South Africa, Pondoland, *Drège 4384* (B, holo., possibly destroyed; P, iso.). Figure 45J–L.

Cyperus aromaticus (Ridl.) Mattf. & Kük. var. *elatior* (Kunth) Kük.: 582 (1936).

Kyllinga pinguis C.B. Clarke: 131 (1906b). *Cyperus pinguis* (C.B. Clarke) Mattf. & Kük.: 583 (1936); R.W. Haines & Lye: 239 (1983). Type: Uganda, Entebbe, *E. Brown 26* (K, holo.).

Icones: Getliffe: fig. 13 (1983); R.W. Haines & Lye: fig. 481 (1983).

Vouchers: *Getliffe 165, 196, 215, 31; Killick 375; Ward 4961, 4971, 4065, 4965.*

Description: Getliffe: 291 (1983).

Distribution: Coast, Midlands, Zululand (Ngoye Forest).

K. elatior should not be readily confused with other Natal species. It may be recognised by the soft texture of the whole plant and the triquetrous culms each carrying a central cylindrical to elliptic greenish spike, sometimes accompanied by 1 or 2 shorter lateral spikes, surrounded by 4–6 long (up to 290 mm), bracts that spread at right angles. In moist, shaded situations where plants may form extensive pure stands, these bracts intermingle giving an impression of dense leafiness. Leaf blades, however, usually short and few per culm, lemon-scented when bruised. Pliable, looping rhizomes fragrant when dug, but the volatile principle soon evaporates. Plants from less favourable habitats, smaller and less lush. Occupies glades along river banks and in woodland.

5. **Kyllinga erecta** *Schumach.* in Beskrivelse af guineeiske planter som ere fundne af danske botanikere, isaer af Etatsraad Thonning: 62 (1827); C.B. Clarke: 528 (1894b); C.B. Clarke: 152 (1897/98) ; C.B. Clarke: 274 (1901/02); Schönland: 20 (1922); Getliffe: 293 (1983). Type: West Africa, Guinea, *Isert & Thonning* (C). Figure 46A–C.

Cyperus erectus (Schumach.) Mattf. & Kük.: 588 (1936); *C. erectus* (Schumach.) Mattf. & Kük. subsp. *erectus*; R.W. Haines & Lye: 238 (1983).

Kyllingia [Kyllinga] aurata Nees: 139 (1835); Kunth: 137 (1837); Boeck.: 422 (1867/68); Ridl.: 146 (1884). *Cyperus erectus* (Schumach.) Mattf. & Kük. var. *auratus* (Nees) Kük.: 589 (1936). Type: unknown.

Kyllinga colorata sensu J.B. Hutch.: 487 (1936) non (L.) Druce.

Icones: Schönland: t. 2 (1922); Getliffe: fig. 15 (1983); R.W. Haines & Lye: fig. 478 (1983); Vanden Berghen: fig. 199 (1988).

Vouchers: *Getliffe 170, 176, 204, 229; Ross 659, 687, 694; Ward 1793, 4144; Wright 296.*

Description: Getliffe: 292 (1983).

Distribution: widespread.

Best recognised by solitary, globose, greenish to golden spike and well-developed rhizome (4–5 mm in diameter) clothed in acuminate, reddish brown, seldom overlapping scales. Erect culms (seldom exceeding 400 mm in height, except in shaded situations or in competition with tall plants) almost contiguous (the occasional wide interval exceeding 10 mm does occur, however). Culm bases have been described as 'swollen'; rather, the whole rhizome is fleshy especially following removal from soil. In Natal the species abounds in open swampy grassland and in vleis. Occasionally a weed or a ruderal. Appears to undergo hybridization and subsequent introgression with associated species (*K alata*? (No. 1); *K. melanosperma?* (No. 7)) giving rise to aberrants that are close enough morphologically to be associated problematically with typical *K. erecta* [see *K. pauciflora* (No. 10)]. There is close relationship between *K. erecta, K. brevifolia* (No. 3) and *K. intricata* (No. 6).

6. **Kyllinga intricata** *(C.B. Clarke) Cherm.* in Bulletin du Museum d'histoire naturelle 25: 211 (1919a); Cherm.: 335 (1935); Podlech: 31 (1967); Getliffe: 292 (1983). Type: Madagascar, *Hildebrandt 3788* (K, holo.). Figure 46D–F.

K. erecta Schumach. var. *intricata* C.B. Clarke: 529 (1894b). *Cyperus erectus* (Schumach.) Mattf. & Kük. var. *intricatus* (C.B. Clarke) Kük.: 590 (1936). *C. brevifolius* (Rottb.) Hassk. subsp. *intricatus* (Cherm.) Lye: 2 (1983d); R.W. Haines & Lye: 236 (1983).

Kyllingia [Kyllinga] aurata Boeck.: 515 (1879), non Nees: 139 (1835).

Kyllinga aurata sensu Napper: 21 (1966), non Nees: 139 (1835).

Icones: Getliffe: fig. 14 (1983); R.W. Haines & Lye: fig. 475 (1983).

Vouchers: *R. I'Ons s.n.* (collected 24-12-82); *Medley Wood 1076.*

Description: Getliffe: 292 (1983).

Distribution: Coast, Midlands (?).

Regarded by Getliffe (1983) as a tropical species with limited distribution in South Africa. Natal was included in its distributional range, but only one specimen collected at Verulam in 1880 (*Medley Wood 1076*) was cited. During field work in Natal, Getliffe (1964) found no convincing evidence of presence of *K. intricata* as distinct from *K. erecta* (No. 5) and concluded indirectly that 'perhaps, type (*K. erecta*) and variety (*K. intricata*) are sympatric within populations referred to the type'. Distinguished from *K. erecta* by: more slender rhizomes with culms that are never contiguous (separated by distances of 10–30 mm); mucros of glume apices shorter by 0.1–0.2 mm. Other gatherings from Natal (*I'Ons s.n.; Baijnath 150; Harrison 433; Moll 1083*) have been referred to this species subsequently, but the number of collections is few and in some of the plants there are zones where the culms are closely placed on the rhizome. It is possible that Natal examples referred to *K. intricata* are no more than edaphic variants of the widespread *K. erecta*. This needs further study.

In tropical Africa plants fitting *K. intricata* are far more frequent than further south, but there is nevertheless doubt as to the status of the taxon and its closest affinity. Robinson (1959) considered *K. erecta* var. *intricata* differed only in rhizome colour from [*K. brevifolia* (sub. *K. colorata* (L.) Druce)] and this relationship has been substantiated by Haines & Lye (1983) who record *Cyperus brevifolius* subsp. *intricatus* for East Africa.

7. **Kyllinga melanosperma** *Nees* in Linnaea 9: 286 (1834b) nom. nud.; Nees: 91 (1834a); C.B. Clarke: 529 (1894b); C.B. Clarke: 153 (1897/98); C.B. Clarke: 277 (1901/02); Schönland: 20 (1922); Getliffe: 296 (1983).

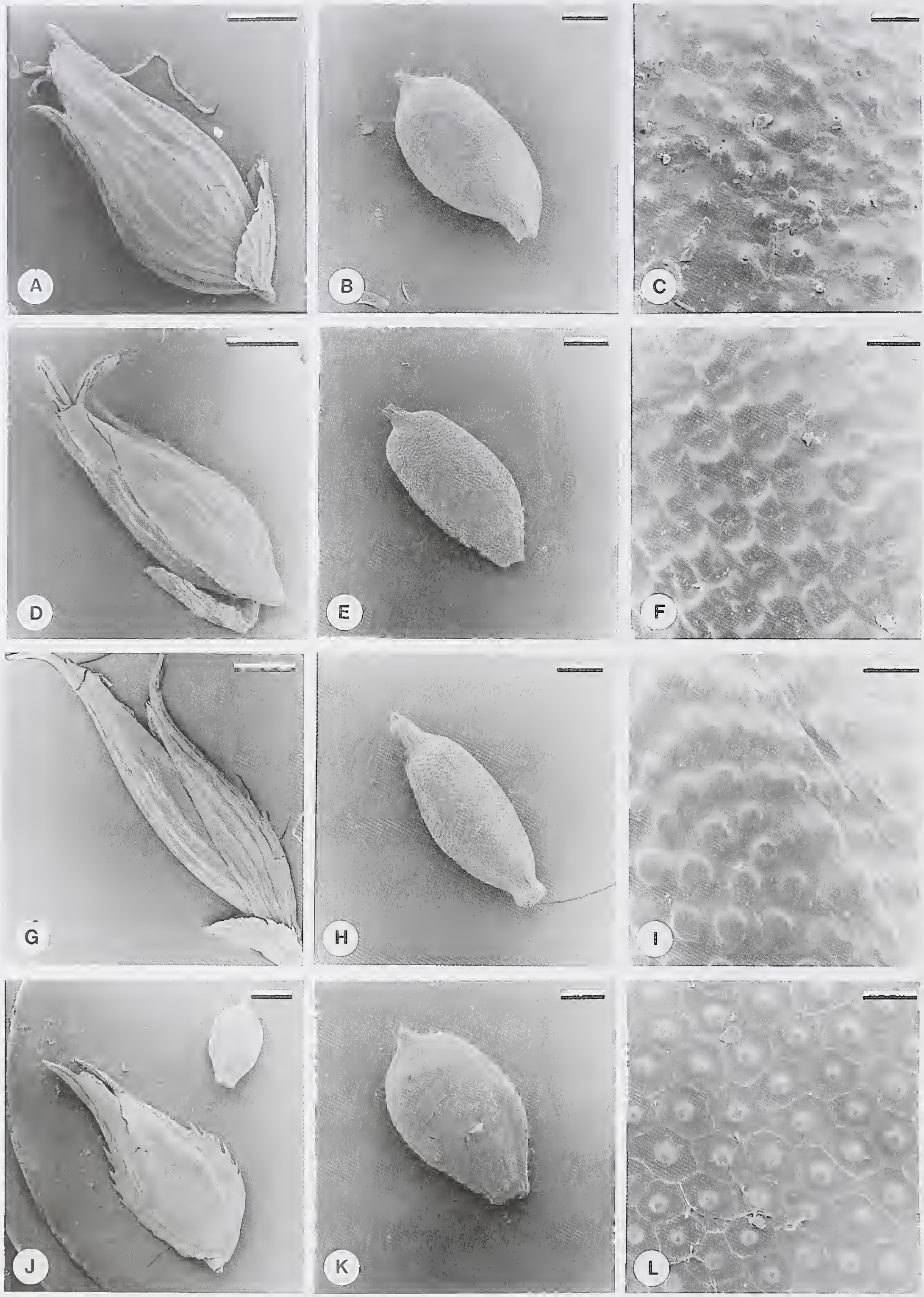

FIGURE 46.—*Kyllinga*. A–C, *K. erecta*, *Getliffe 229*; D–F, *K. intricata*, *Edwards 1759*; G–I, *K. melanosperma*, *Getliffe 293*; J–L, *K. nemoralis*, *Getliffe 1319*. Scale bars: A, D, G, J, 500 µm; B, E, H, K, 250 µm; C, F, I, L, 25 µm.

Type: India, *Wight 1851* (K, holo.) [Koyama (1985) gives the collector as Rottler]. Figures 46G–I; 47.

Cyperus melanospermus (Nees) J.V. Suringar: 50 (1898); Kük.: 583 (1936). *C. melanospermus* (Nees) J.V. Suringar subsp. *melanospermus*; R.W. Haines & Lye: 240 (1983).

Icones: Schönland: t. 3 (1922); Getliffe: fig. 16 (1983).

Vouchers: *J. Browning 240; Edwards 2190, 2357; Getliffe 223, 227, 267, 283, 293.*

Description: Getliffe: 296 (1983).

Distribution: widespread.

Best recognised by its general facies, namely: congested rhizomes that form uniseriate rows or crowded branched masses, or both; tall, triangular, closely packed culms that bear subglobose to ovoid-cylindric, solitary golden green spikes (sometimes rust-coloured under unfavourable conditions or in age) subtended by 3–4 rather short, stiff bracts, at first erect, but later reflexed to angles of 45° with culms. Common in Natal, forming conspicuous clumps particularly along streamlet margins, always near water, especially obvious in spring and summer.

Haines & Lye (1983) suggest the relationship between Indian and African plants referred to this species should be tested. Koyama (1985), for Ceylon, mentions that identification is facilitated by the strong odour given off when the rhizome is damaged, due to volatilisation of the essential oil present.

8. **Kyllinga nemoralis** *(J.R. Forst. & G. Forst.) Dandy ex Hutch. & Dalziel*, Flora of west tropical Africa 2: 487 (1936); Getliffe: 272 (1983). Type: Society Islands, *J.R. & G. Forster.* Figure 46J–L.

Thryocephalum nemorale J.R. Forst.& G. Forst.: 129 (1776).

Kyllinga monocephala Rottb.: 13 (1773) p.p.; Nees: 91 (1834a); C.B. Clarke: 530 (1894b); C.B. Clarke: 272 (1901/02). *Cyperus kyllingia* Endl.: 94 (1842); Kük.: 606 (1936); R.W. Haines & Lye: 247 (1983). A new name for *K. monocephala*.

Icones: Rottb.: t. 13, fig. 4 (1773); C.B. Clarke: t. ii, figs 1, 2 (1909); Kük.: fig. 64 (1936); Getliffe: fig. 6 (1983); R.W. Haines & Lye: fig. 247 (1983).

Vouchers: *Getliffe 59, 123, 193, 996; Ward 1250.*

Description: Getliffe: 272 (1983).

Distribution: Coast.

Widespread species in warmer parts of Old World, especially near sea (Clarke 1901/02); not so frequent in Africa. In Natal, the species is known only from moist partly shaded disturbed coastal situations, usually in sand. Most reliably identified by long slender stolons, pliable and fragrant when fresh, but easily broken on removal from soil. (In herbarium material, fragments of stolons attached to isolated leafy tufts should be looked for.) Without evidence of these organs the species may be confused with *K. brevifolia* (No. 3) or *K. elatior* (No. 4), but it differs from both in the narrow, spinulose, winged keel of glume. Inflorescence a subglobose, white to off-white, often compound head subtended by 3–4 mm long, flaccid bracts, is sometimes proliferous, some spikelets apparently replaced by small vegetative shoots. Getliffe & Baijnath (1976), observed this phenomenon to be correlated with disturbance and water-logging in *Cyperus prolifer* Lam. It may be the outcome of similar conditions here.

9. **Kyllinga odorata** *Vahl*, Enumeratio plantarum 2: 382 (1805); Getliffe: 278 (1983). Type: Habitat in Americo meridional v. Rohr. *Richard* (not traced). Figure 48 A–C.

K. sesquiflora Torr.: 287 (1836). *Cyperus sesquiflorus* (Torr.) Mattf. & Kük.: 591 (1936). *C. sesquiflorus* (Torr.) Mattf. & Kük. subsp. *sesquiflorus*; R.W. Haines & Lye: 241 (1983). Type: America, Florida *Chapman s.n.*.

K. cylindrica Nees: 91 (1834a); C.B. Clarke: 528 (1894b); C.B. Clarke: 153 (1897/98); C.B. Clarke: 282 (1901/02). *K. triceps* Rottb. var. *obtusiflora* Boeck.: 414 (1867/68). *Cyperus triceps* (Rottb.) Endl. var. *obtusiflorus* (Boeck.) Kük.: 579 (1936); *C. sesquiflorus* (Torr.) Mattf. & Kük. var. *cylindricus* (Nees) Kük.: 593 (1936). *C. sesquiflorus* (Torr.) Mattf. & Kük. subsp. *cylindricus* (Nees) T. Koyama: 187 (1970); R.W. Haines & Lye: 241 (1983). Type: India, herb. *Royle 39* (LIV, holo.).

Icones: Getliffe: fig. 8 (1983); R.W. Haines & Lye: figs 483, 484 (1983); Vanden Berghen: fig. 200 (1988).

Vouchers: *Getliffe 179, 212, 216; Mogg 4428, 4522; Ross 721, 726.*

Description: Getliffe: 279 (1983).

Distribution: Coast, Midlands, Zululand.

As may be seen from the types, *K. odorata* is based on American material and *K. cylindrica* on a gathering from India. Getliffe (1983) states that African plants have been assigned to both species. Kükenthal (1936) regarded these species as variants, recognizing each at varietal level within *Cyperus sesquiflorus*. He relegated *K. odorata*, with a wider inflorescence and longer spikelets, to the typical variety, placing *K. cylindrica* within the variety of that name. R.W. Haines & Lye (1983) have subsequently adopted subspecific ranking for the infraspecific categories (implying allopatric distributions?). These authors state that the typical subsp. is larger in all its parts than is subsp. *cylindricus* with a spinescent keel to its glumes. Getliffe does not believe it advantageous to discriminate at infraspecific level for southern African plants, so this has been followed here.

In Natal *K. odorata* is a component of grassland, particularly disturbed grassland, and may be a weed. It has not been recorded from northern Natal (where it is probably present) nor from the Uplands (where it is likely to be absent). Most easily recognised by its tufted habit (annual or short-lived perennial) with, occasionally, a short row of stem bases forming a poorly developed rhizome, and by the cylindrical spike (white at maturity) accompanied in robust examples by two lateral spikes. Mature achenes glossy black, their colour making them just detectable through glume tissue. In most Natal examples the wingless glume keels are smooth.

10. **Kyllinga pauciflora** *Ridl.* in Transactions of the Linnean Society of London Ser. 2: 147 (1884); C.B. Clarke: 530 (1894b); C.B. Clarke: 152 (1897/98); C.B. Clarke: 273 (1901/02); Getliffe: 268 (1983). Type: Angola, between Ferrao de Sola and Catumba, *Welwitsch 6811* (BM, holo.). Figure 48D–F.

Cyperus ridleyi Mattf. & Kük.: 559 (1936); R.W. Haines & Lye: 237 (1983).

Icones: Ridl.: t. 23, figs 1–4 (1884); Getliffe: fig. 4 (1983); R.W. Haines & Lye: fig. 476 (1983).

Vouchers: *Downing 124, 142, 152, 153, 156; Edwards 2442; Getliffe 224; Huntley 443; Killick 1103, 1273; Moll 680.*

Description: Getliffe: 268 (1983).

Distribution: Midlands, Uplands.

The Natal specimens assembled under *K. pauciflora* are characterised by few spikelets (6–20) within the inflorescence and many inflorescences exhibiting ‘vivipary’ (vegetative apomixis), both unusual features within *Kyllinga*. Spikelets generally golden in colour. There seems

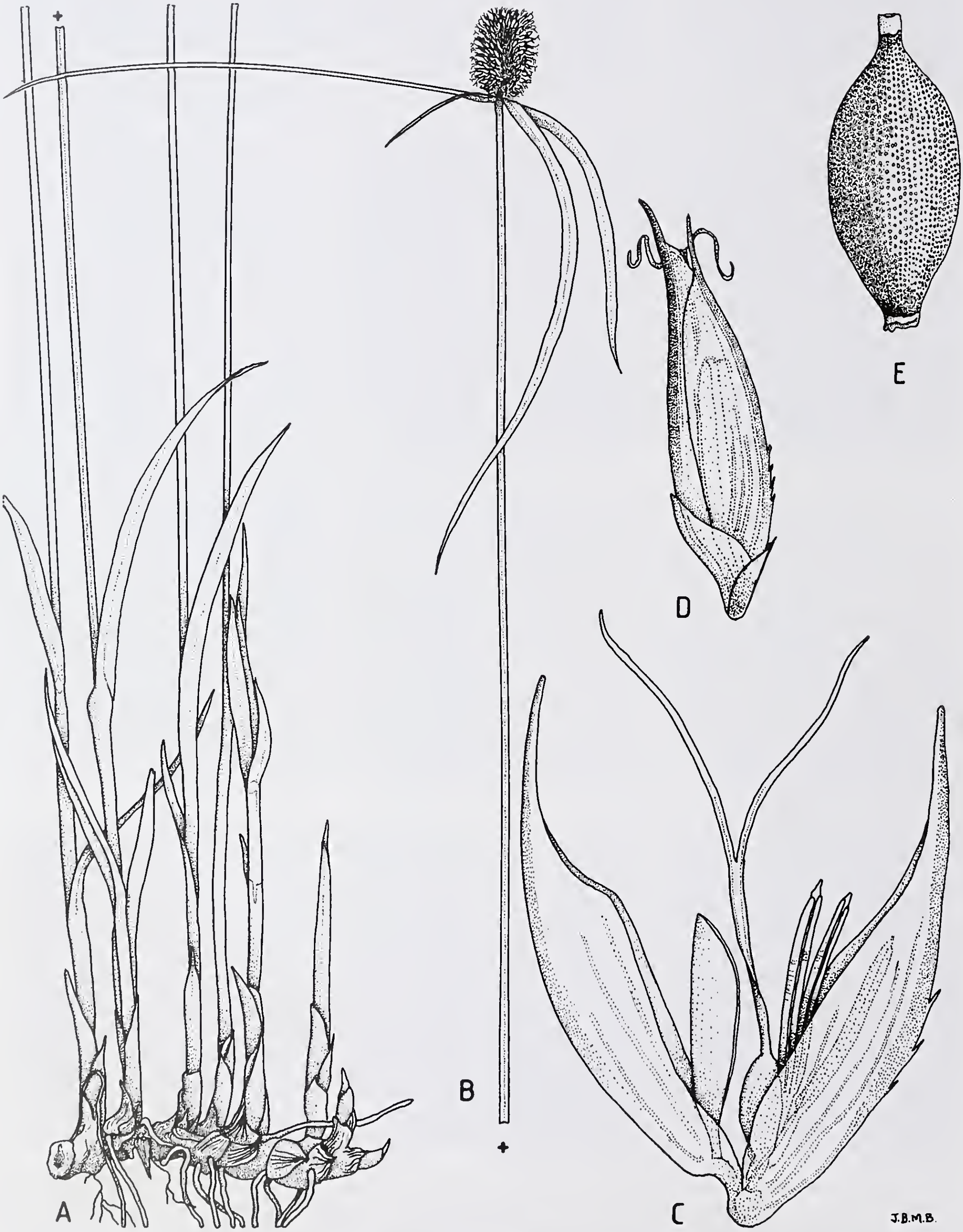

FIGURE 47.—*Kyllinga melanosperma, J. Browning 240.* A, plant, × 1; B, culm and inflorescence, × 1; C, two lower sterile glumes removed and remaining glumes displaced to show bisexual floret, × 30; D, spikelet, × 23; E, achene, × 35.

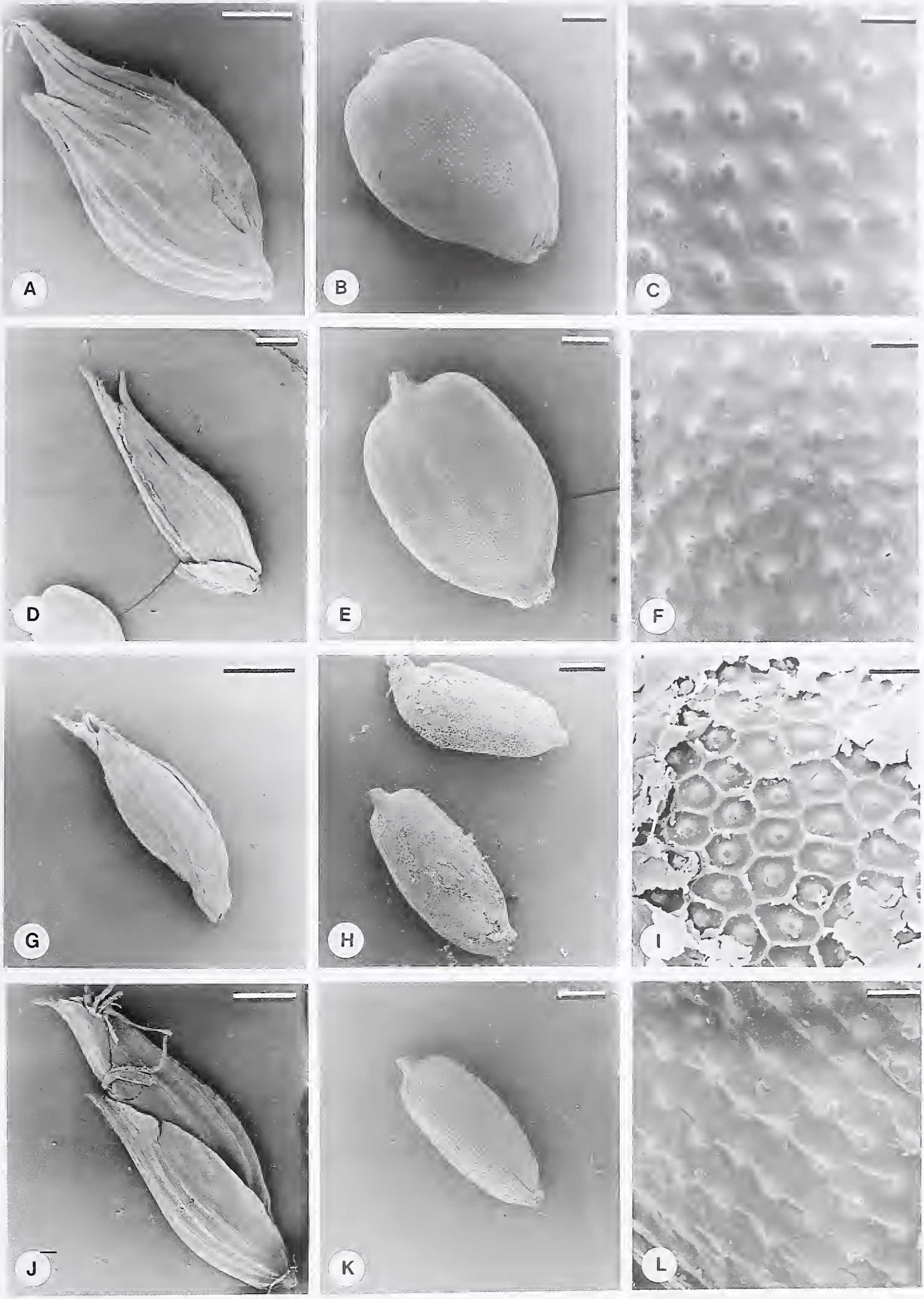

FIGURE 48.—*Kyllinga*. A–C, *K. odorata, Wells 1089*; D–F, *K. pauciflora, Gibbs Russell 1195*; G–I, *K. polyphylla, Getliffe 194*; J–L, *K. pulchella, Lubke 61*. Scale bars: A, D, G, J, 500 µm; B, E, H, K, 250 µm; C, F, I, L, 25 µm.

little doubt that relationship is with *K. erecta* (No. 5) and it is mostly in the vicinity of this species that plants referable to *K. pauciflora* have been found. *K. pauciflora* is an inhabitant of damp or swampy grassland.

There has been some uncertainty over the application of Ridley's name. Specialists at Kew applied it to some of the cited Natal specimens (*Huntley 443; Killick 1273*), as well as to tropical African specimens that Robinson (1959) preferred to place with *K. intricata* (*K. erecta* var. *intricata*). Getliffe (1983) could not uphold Robinson's opinion, however, as the Natal plants investigated in the field generally possessed the contracted rhizomes of *K. erecta* rather than the more elongated type of *K. intricata*. Getliffe also found gradation in spikelet length from tropical examples of *K. pauciflora* to measurements representative of Natal plants.

It seems most likely that *K. pauciflora*, as it is known in Natal, represents the outcome of past hybridisation of *K. erecta* with an unidentified partner, but until karyotypes and breeding strategies are investigated, this must remain uncertain. Whether Ridley's name should continue to be applied to plants other than his type also requires re-assessment.

11. **Kyllinga polyphylla** *Willd. ex Kunth*, Enumeratio plantarum 2: 134 (1837); C.B. Clarke: 531 (1894b); C.B. Clarke: 276 (1901/02); Getliffe: 298 (1983). Type: West Africa, *Herb. Willdenow 1441* (B, holo.)? [Koyama (1985), adds syntypes from Mauritius and Congo (Zaïre), but records no other details]. Figure 48G–I.

K. macrantha Boeck.: 420 (1867/68) p.p. *K. erecta* Schumach. var. *polyphylla* (Willd. ex Kunth) S.S. Hooper: 580 (1972).

K. aromatica Ridl.: 146 (1884); *K. planiceps* C.B. Clarke: 531 (1894b); C.B. Clarke: 279 (1896). *K. elatior* auct. non Kunth: C.B. Clarke: 528 (1894b) Angolan specimens. *Cyperus aromaticus* (Ridl.) Mattf. & Kük.: 581 (1936); R.W. Haines & Lye: 239 (1983). Type: Angola, Pungo Andongo, *Welwitsch 6801* (LISU, holo.).

Icones: Getliffe: fig. 17 (1983); R.W. Haines & Lye: fig. 480 (1983).

Vouchers: *Getliffe 28, 164, 194, 282.*

Description : Getliffe: 300 (1983).

Distribution: Coast.

In Natal, known only from Durban where introduction may have taken place. Getliffe (1983) described the population as 'well established but very localised'. Specimens were compared with ample material in the British Museum, so the accuracy of the identification is not open to question. The species is tropical and Getliffe's material is the southernmost known record in Africa. Affinity is with *K. melanosperma* from which *K. polyphylla* is most easily differentiated by its inflorescence and bracts (always more than one spike, usually 3, confluent into a subglobose head subtended by 3–(6–8) spreading bracts, contrasted against the ovate-cylindric, occasionally subglobose always solitary spike subtended by 3, or 3 + 1 short, stiff, later reflexed bracts of *K. melanosperma*). In other parts of Africa, *K. polyphylla* has sometimes been confused with *K. elatior*. This is hardly likely in Natal since *K. elatior* here is a softer plant with an elongate rhizome carrying erect culms far more distantly placed.

12. **Kyllinga pulchella** *Kunth*, Enumeratio plantarum 2: 137 (1837); C.B. Clarke: 531 (1894b): C.B. Clarke: 154 (1897/98); C.B. Clarke: 284 (1901/02); Podlech: 31 (1967); Getliffe: 271 (1983); Hilliard & B.L. Burtt: 114 (1987); Hilliard: 55 (1987). Type: South Africa, Cape Province, Albert Division, *Drège 7384* (K, holo.). Figure 48J–L.

Cyperus teneristolon Mattf. & Kük.: 574 (1936); R.W. Haines & Lye: 233 (1983). Type: as for *K. pulchella*.

K. atrosanguinea Steud.: 598 (1842); Steud.: 69 (1855). Type: Ethiopia, *Schimper 1269*.

C. transitorius Kük.: 574 (1936). Syntypes: Tanganyika, bei Saranda, *Peter 33396, 33587.*

Icones: Getliffe: fig. 5 (1983); R.W. Haines & Lye: fig. 470 (1983); Davis in Hilliard: 55 (1987).

Vouchers: *Getliffe 22; 2058; Moll 680; C.J. Ward 6025.*

Description: Getliffe: 271 (1983).

Distribution: Midlands, Uplands.

Most distinctive of the Natal species, easily recognised by its slender habit, dark red or reddish brown inflorescences and numerous delicate stolons (less than 1 mm in diameter) that link the tufts (easily broken on removal from soil). Now becoming uncommon, probably due to interference with its natural habitats in Midlands. Usually found in fairly open areas of dampish, sometimes rather bare, grassland, or associated with rocky outcrops. Peduncled lateral heads sometimes produced within inflorescences. *Cyperus transitorius* was established for such examples, but this taxon is not now maintained.

0452000 **LIPOCARPHA**

Lipocarpha *R. Br.* in J.K. Tuckey, Narrative of an expedition to explore the river Zaire, Appendix 5: 459 (1818), nom. conserv.; Nees: 287 (1834b); Kunth: 266 (1837); Steud.: 129 (1855); Boeck.: 114 (1871–1873); Ridl.: 162 (1884); C.B. Clarke: 265 (1897/98); C.B. Clarke: 468 (1901/02); Schönland: 53 (1922); R.A. Dyer: 879 (1976); Goetgh.: 302 (1980); R.W. Haines & Lye: 294 (1983); Goetgh. & Van den Borre: 6 (1989). Type species: *L. argentea* (Vahl) R. Br., name illegit. [based on *Hypaelyptum argenteum* Vahl: 283 (1805), where *Scirpus senegalensis* Lam. is given as a synonym; see *Lipocarpha chinensis* (No. 1)].

Hypolytrum L.C. Rich.: 70 (1805), p.p. non typica.

Hypaelyptum Vahl: 283 (1805), p.p. typica; R. Br.: 219 (1810); K. Schum.: 126 (1895). Lectotype: *H. filiforme* Vahl [lectotypification by Panigrahi: 511 (1985)].

Tunga Roxb.: 187 (1820), p.p. typica. Lectotype: *T. triceps* Roxb. [lectotypification by Goetgh. & Van den Borre: 7 (1989)].

Hemicarpha Nees: 287 (1834b); Kunth: 268 (1837); R.W. Haines & Lye: 477 (1971); Goetgh.: 303 (1980). Type: *H. isolepis* Nees, name illegit.

Rikliella J. Raynal: 154 (1973); Govind. & J. Raynal: 220 (1976); Goetgh.: 303 (1980); R.W. Haines & Lye: 301 (1983). Type: *R. rehmannii* (Ridl.) J. Raynal.

There has been difficulty in the morphological interpretation of the inflorescence and its parts in *Lipocarpha*. Until recently, it was accepted that the inflorescence (a head of several sessile units, or reduced to one unit only) comprised spikelets, each consisting of an axis bearing numerous spirally arranged glumes. Each glume carried an axillary bisexual floret with a perianth of two dorsiventral hypogynous scales. Recent work [Goetgh. & Van den Borre (1989) and some earlier authors], has resulted in each inflorescence unit being interpreted as an axis bearing spirally arranged bracts (a spike). In the axil of each bract is a one-flowered spikelet and two small scales. The upper scale is abaxial (a glume); the lower is adaxial (a prophyll).

This is the interpretation accepted in the present work (except in the key to genera, where the older interpretation has been followed). If the two scales accompanying the floret are sufficiently reduced (lost) as seems to be the case in *L. rehmannii* (Ridl.) Goetgh. [= *Rikliella rehmannii* (Ridl.) J. Raynal; = *Scirpus rehmannii* Ridl.], it is not possible to distinguish the unit of the inflorescence (a spike) from the spikelet in *Scirpus*.

Key to species

1a Bisexual floret unaccompanied by glume or prophyll within the subtending bract .... 5. *L. rehmannii*
1b Bisexual floret accompanied by both glume and prophyll within the subtending bract, OR prophyll markedly reduced so as to be virtually absent (*L. micrantha*) 2

2a Tufted perennials with leaves 1–5 mm wide .... 1. *L. chinensis*
2b Slender annuals with leaves not wider than 1 mm 3

3a Inflorescence terminal (very seldom pseudolateral), a head of 4–1 (generally 3) spikes. Bracts of the spikes with an acuminate, recurved apex 0.4–0.8(–1.3) mm long ......4. *L. nana*
3b Inflorescence pseudolateral of 1–2(–3) spikes. Bracts of the spikes either mucronate or slightly prolonged into an acuminate apex not longer than 0.25 mm 4

4a Bracts of the spike 0.4–0.7 mm wide, broadly obovate, apex mucronate (sometimes prolonged into a smooth apiculum 0.2–0.5 mm long). Prophyll and glume 0.5–0.7 mm long ....2. *L. hemisphaerica*
4b Bracts of the spike 0.3–0.4 mm wide, obovate, apex prolonged into a scabrid apiculum up to 0.25 mm long. Spikelet prophyll reduced, often deeply bifid or virtually absent (difficult to observe) .... 3. *L. micrantha*

1. **Lipocarpha chinensis** *(Osbeck) J. Kern* in Blumea, Supplement 4: 167 (1958b); Napper: 22 (1965); R.W. Haines & Lye: 473 (1971); R.W. Haines & Lye: 296 (1983); Goetgh. & Van den Borre: 27 (1989). Type: China, *Osbeck s.n.* (S, holo.). Figure 49A–C.

Scirpus chinensis Osbeck: 220 (1757).

S. senegalensis Lam.: 140 (1791). *Hypolytrum senegalense* (Lam.) L.C. Rich.: 70 (1805) non C.B. Clarke (1901/02). Type: Senegal, *Roussillon s.n.* coll. 1789 (P–LA, holo.; G, P, iso.).

Hypaelyptum argenteum Vahl: 283 (1805), name superfluous for *S. senegalensis* Lam. *Hypolytrum argenteum* (Vahl) Kunth: 218 (1816) with respect to the combination. *Lipocarpha argentea* (Vahl) R. Br.: 477 (1818) name superfl.; Nees: 287 (1834b); Steud.: 129 (1855); Ridl.: 163 (1884); C.B. Clarke: 265 (1897/98); C.B. Clarke: 469 (1901/02); Schönland: 53 (1922). Syntypes: India, *Koenig s.n.* (C); Senegal, *Dupuis s.n.* (C, G).

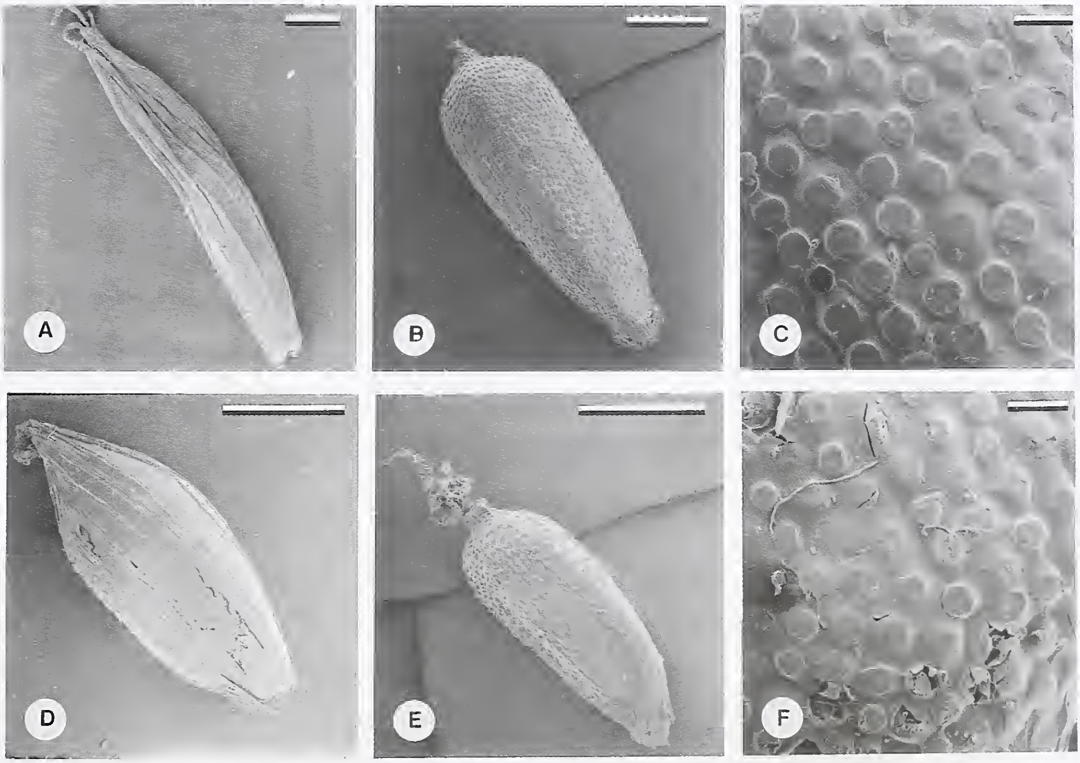

FIGURE 49.—*Lipocarpha*. A–C, *L. chinensis, J. Browning 213*; D–F, *L. nana, K.D. Gordon-Gray s.n.* Scale bars: A, B, D, E, 250 µm; C, F, 25 µm.

Icones: Schönland: t. 56 (1922); Napper: fig. 51 (1965); R.W. Haines & Lye: fig. 1 (1971); R.W. Haines & Lye: fig. 613 (1983); Vanden Berghen: fig. 210 (1988); Goetgh. & Van den Borre: fig. A, 6, 39A–D (1989).

Vouchers: *Killick 498; Morris 831; Strey 4236, 5176; C.J. Ward 4823, 5457.*

Description: Goetgh. & Van den Borre: 27 (1989).

Distribution: Coast, Midlands, Zululand.

Distinctive among Natal sedges because of its rather characteristic facies. Plants tufted, leafy perennials bearing compact heads of neat white spikes that look like spikelets. With age, heads appear looser because of deciduous bracts that fall successively from bases of spikes to expose scarred axes. Leaves channelled and sometimes tend towards succulence. Favoured habitat is aerated water of streamlet margins or very damp mud on fringes of drainage channels.

2. **Lipocarpha hemisphaerica** *(Roth) Goetgh.* in Goetgh. & Van den Borre in Wageningen Agriculture University Papers 89, 1,: 37 (1989). Type: India, *Heyne s.n.* (B). Figure 50A, B.

Scirpus hemisphaericus Roth: 29 (1821). *Isolepis hemisphaerica* (Roth) A. Dietr.: 109 (1832/33).

Isolepis minima Schrad.: 2068 (1821). Type: South Africa, *Hesse s.n.*

Hemicarpha isolepis Nees: 263 (1834c); Kunth: 268 (1837); Steud.: 130 (1855); Ridl.: 161 (1884); J. & A. Raynal: 319 (1967). *Scirpus isolepis* (Nees) Boeck.: 498 (1869/70); C.B. Clarke: 233 (1897/98); C.B. Clarke: 459 (1901/02); Schönland: 40 (1922); Napper: 14 (1965). *L. isolepis* (Nees) R.W. Haines in R.W. Haines & Lye: 476 (1971); Goetgh.: 303 (1980); R.W. Haines & Lye: 300 (1983). Type: from India, *Wight s.n.* (collected 1856?) (C, G, K, LE, NY, iso.).

Hemicarpha schraderi Kunth: 268 (1837) name superfl.; A. Rich.: 507 (1851); Steud.: 130 (1855). Type: South Africa, Cap. b. spei, Coll.?

H. senegalensis Steud.: 130 (1855). Type: Senegal, *Leprieur 39*, collected 1827 (P, holo.; NY, P, iso.).

L. rautanenii Boeck.: 179 (1890b). Type: Namibia, *Rautanen 2* (Z, holo.).

L. monocephala Turrill: 307 (1913). Type: Zimbabwe, *Rogers 6024* (K, holo.).

Icones: R.W. Haines & Lye: fig. 622 (1983); Vanden Berghen: fig. 211 as *Lipocarpha isolepis*; Goetgh. & Van den Borre: fig. 13 (1989).

Voucher: *F. Bayer s.n.* (Rorke's Drift, Tugela Valley basin).

Description: Goetgh. & Van den Borre: 37 (1989).

Distribution: N Natal, but perhaps Midlands also?

L. hemisphaerica has been collected only once in Natal, but must be better represented than records indicate. Plants small, rather delicate tufted annuals growing in moss mats on very shallow soil overlying rock outcrops. Best recognised by inflorescence that is a single, neat, apparently lateral spike, overtopped by a well-developed main bract that continues in the line of the culm.

3. **Lipocarpha micrantha** *(Vahl) G.C. Tucker* in Journal of the Arnold Arboretum 68: 410 (1987); Goetgh. & Van den Borre: 48 (1989). Type: French Guyana, *L.C. Richard s.n.* (P, holo.).

Scirpus micranthus Vahl: 254 (1805); Boeck.: 499 (1869/70); Rendle: 128 (1899); C.B. Clarke: 459 (1901/02).

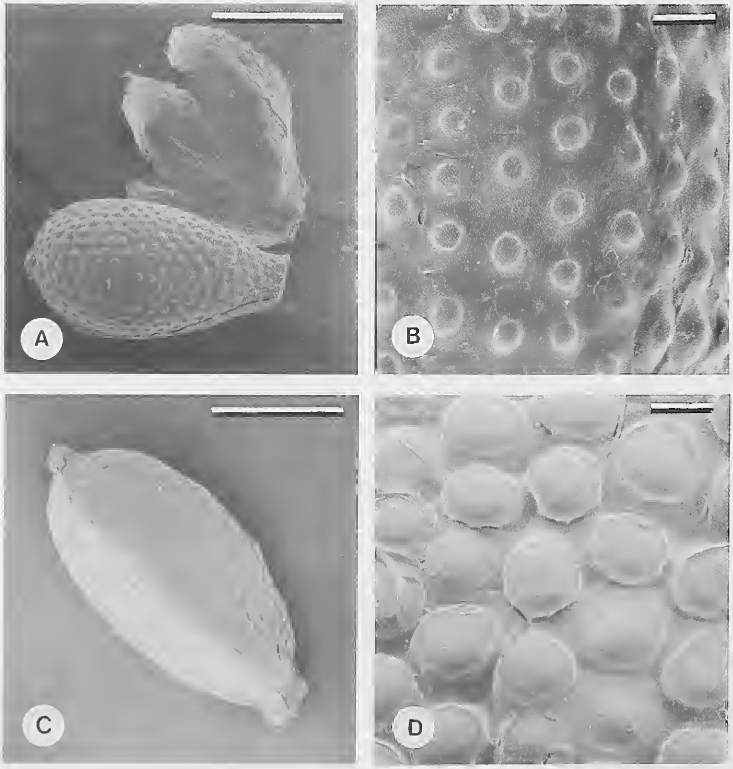

FIGURE 50.—*Lipocarpha*. A, B, *L. hemisphaerica, F. Bayer s.n.*; C, D, *L. rehmannii, Goldsmith 7*. Scale bars: A, C, 250 µm; B, D, 25 µm.

Isolepis micrantha (Vahl) Roem. & Schult.: 110 (1817); Kunth: 203 (1837). *Hemicarpha micrantha* (Vahl) Pax: 105 (1888); J. & A. Raynal: 320 (1967); Cl. Reid: 45 (1986). *H. micrantha* (Vahl) Britton: 104 (1888) comb. superfl.; Podlech: 27 (1967); Goetgh.: 303 (1980).

I. squarrosa auct., non (L.) Kunth: Kunth: 203 (1837); Boeck.: 500 (1869/70).

Icones: Vanden Berghen: fig. 212 (1988); Goetgh. & Van den Borre: fig. 19 (1989).

Voucher: *Cl. Reid* 1026 (PRE).

Description: Goetgh. & Van den Borre: 48 (1989).

Distribution: Maputaland.

Dwarf annuals with a poorly developed rooting system. Grow in damp, often disturbed, situations amongst other small sedges and grasses (easily overlooked), or on alluvium bordering water of temporary pools or streamlets. Most easily recognised by its pseudolateral inflorescence of few spikes. May be confused with *L. hemisphaerica* (No. 2), but in this last species only a solitary spike is usually developed. In *L. micrantha*, prophyll very much reduced, or may be lacking, whereas in *L. hemisphaerica* prophyll and glume closely envelop achene; both white, delicate and difficult to lift from maturing fruit (more easily identified in younger florets).

Wide distribution in the Americas, from Canada to Uruguay, as well as being scattered through Africa from Senegal to Natal. It has received many names of which only the most familiar synonyms are recorded here.

4. **Lipocarpha nana** *(A. Rich.) Cherm.* in Bulletin Société botanique de France 71: 142 (1924); Goetgh. & Van den Borre: 55 (1989). Type: Ethiopia, *Quartin-Dillon & Petit s.n.* (P, holo.). Figures 49D–F; 51.

Fuirena nana A. Rich.: 497 (1851). *L. nana* (A. Rich.) J. Raynal: 84 (1967a) comb. superfl.; R.W. Haines & Lye: 299 (1983).

L. pulcherrima Ridl.: 162 (1884); C.B. Clarke: 266 (1897/98); C.B. Clarke: 473 (1901/02); Napper: 23 (1965). *Hypaelyptum pulcherrimum* (Ridl.) K. Schum.: 127 (1895). Syntypes: Angola, Catete, *Welwitsch 6774* (BM, COI); Angola, Quilange, *Welwitsch 6774* (BM); Angola, Huilla, *Welwitsch 6775*; Angola, Catete, *Welwitsch 6785* (BM).

L. pulcherrima Ridl. forma *luxurians* Merxm. in Suess. & Merxm.: 164 (1952). Type: Mozambique, *Schweickerdt 2319* (M, holo.).

L. atropurpurea Boeck.: 21 (1888). Type: Malawi, *Buchanan 69* (B, holo.; K, LE, NY, P, iso.).

L. tenera Boeck.: 21 (1888). Type: Malawi, *Buchanan 63* (B, holo.).

Icones: R.W. Haines & Lye: figs 618, 619 (1983); Goetgh. & Van den Borre: fig. 22 (1989).

Vouchers: *K.D. Gordon-Gray s.n.* (False Bay Park); *I'ons 40/81; Johnstone 336.*

Description: Goetgh. & Van den Borre: 55 (1989).

Distribution: Coast, Midlands, Uplands, N Natal, Maputaland (probably also in Zululand, but not recorded).

Delicate, sparsely tufted to slender annuals growing in moss mats covering shallow soil overlying rock outcrops. Inflorescence of several spikes bearing dark reddish bracts with long acuminate, recurved yellowish to greenish apices is easiest means of identification. Very easily overlooked unless present in considerable number.

Note: Goetghebeur's & Van den Borres' (1989) description states 'Spikelet bract ... apical part ... long acuminate, recurved, scabrid at the top ...'. In Figure 51 of the present work no scabridities are shown. They are usually lacking in Natal plants (if present extremely few and minute and confined to the tip only; never present on the lateral surfaces).

5. **Lipocarpha rehmannii** *(Ridl.) Goetgh.* in Goetgh. & Van den Borre in Wageningen Agriculture University Papers 89, 1: 64 (1989). Syntypes: South Africa, Natal, Griffin's Hill, near Estcourt, *Rehmann 7305, 7315* (K, Z); Angola, Lopollo, *Welwitsch 6771* (BM). Figure 50C, D.

Scirpus rehmannii Ridl.: 159 (1884); J. Raynal: 97 (1968). *Isolepis rehmannii* (Ridl.) Lye in R.W. Haines & Lye: 479 (1971). *Rikliella rehmannii* (Ridl.) J. Raynal: 155 (1973); R.W. Haines & Lye: 301 (1983).

S. hystricoides B. Nord. 55 (1974). Type: Namibia, *Nordenstam 2836* (S, holo.).

S. hystrix auct., non Thunb.: C.B. Clarke: 233 (1897/98) p.p.; C.B. Clarke: 459 (1901/02); Schönland: 40 (1922) p.p.; Podlech: 49 (1967).

S. squarrosus auct., non L.: C.B. Clarke: 458 (1901/02) in respect of *Whyte s.n.* (Nyasaland).

Icones: Schönland: t. 40 (1922); J. Raynal: t. 1, figs 6–8 (1968); R.W. Haines & Lye: fig. 623A, B (1983); Goetgh. & Van den Borre: figs 29, 36F (1989).

Vouchers: *T.H. Arnold 864; Acocks 22174* (PRE); *Rehmann 7305, 7315* (K).

Description: Goetgh. & Van den Borre: 64 (1989).

Distribution: Midlands, Uplands.

Like *L. nana* (No. 4), plants of *L. rehmannii* also grow in damp moss mats developed in shallow soil over rock outcrops. In Natal, plants rather short (100–150 mm) and tufted, but in other localities may reach 200 mm and more. The inflorescence consisting of 3–12 (occasionally reduced to 2–1) crowded spikes bearing spirally arranged dark brown or greenish brown bracts each with a long reflexed apex, is the first means of recognition. Dissection of a spike is necessary to confirm that neither glume nor prophyll surround the bisexual floret situated axially within bract. Margins of basal part of each bract fold against achene of floret.

In the Cape Province is a species named *Isolepis hystrix* (Thunb.) Nees. Plants closely resemble *Lipocarpha rehmannii* and in the past these taxa have been much confused under the name *Scirpus hystrix* Thunb. However, *I. hystrix* has leaf anatomy and achene sculpturing that differ from those of *L. rehmannii*; there is also a different pattern of distribution.

0459030 MARISCUS

Mariscus *Vahl*, nom. conserv. Enumeratio plantarum: 2: 372 (1805); Schrad.: 12 (1832b); Nees: 286 (1834b); Nees: 139 (1835); Kunth: 115 (1837); Steud.: 59 (1855); C.B. Clarke: 584 (1894b); C.B. Clarke: 185 (1897/98); C.B. Clarke: 377 (1901/02); Schönland: 29 (1922); Podlech: 31 (1967); R.A. Dyer: 882 (1976); Vorster: 113 (1978a); P.L. Forbes: 53 (1987b). non Scop.: 22 (1754); nec Zinn.: 79 (1757); nec Gaertn.: 11

(1788). Type: *M. capillaris* (Swartz) Vahl (*Schoenus capillaris* Sw.).

Cyperus L. sect. *Mariscus* (Vahl) Endl.: 119 (1836); Benth.: 1045 (1883); Kern: 641 (1974).

Cyperus L. subgen. *Mariscus* (Vahl) C.B. Clarke: 34 (1884); Kük.: 402 (1936).

Note: species falling within the limits of *Mariscus*, whether treated collectively as a genus (*Mariscus* Vahl),

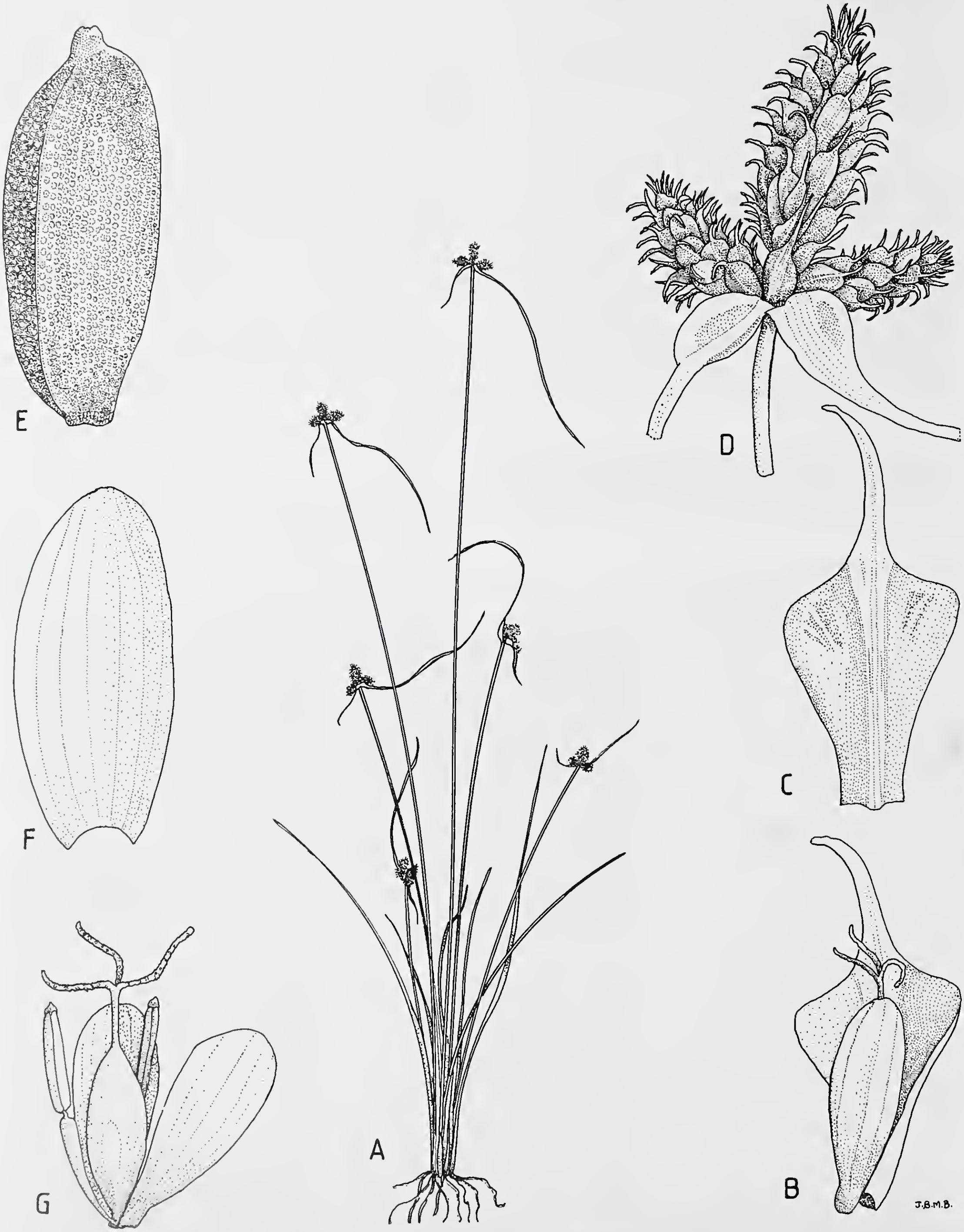

FIGURE 51.—*Lipocarpha nana*, *K.D. Gordon-Gray s.n.*. A, plant, × 1; B, bract and spikelet, × 48; C, bract, abaxial view, × 48; D, inflorescence, × 10; E, mature achene, × 98; F, glume, opened out, × 88; G, spikelet with prophyll and glume displaced to show floret, × 50.

or dispersed among the subgenera *Pycnostachys* C.B. Clarke (type sp.: *C. difformis* L.) and the typical subgenus (lectotype sp.: *C. esculentus* L.) of *Cyperus* L., are inadequately differentiated morphologically from *Cyperus*.

It is generally accepted that in *Mariscus* spikelets fall from the rachis intact (except for the two basal sterile glumes), that is before the fertile glumes abscise from the rachilla; whereas in *Cyperus* the spikelets remain firmly attached to the rachis as the glumes break away and fall individually.

However, there are several species of *Cyperus* (particularly in America, for example *C. strigosus* L.) in which both rachillas and glumes are more or less deciduous. The occurrence of such intermediates has resulted in the formulation of subsidiary rapid aids to the differentiation of *Mariscus* from *Cyperus* (Clarke 1901/02; Schönland 1922). These are summarised as: 1, all examples with leaf blades reduced to sheaths are *Cyperus*; 2, all examples with less than five achenes to the spikelet are *Mariscus*; 3, all examples with the rachilla of the spikelet wingless are *Cyperus*.

It is worth noting that two of the most formidable weeds in Natal (and most of the world), therefore frequently submitted for identification, *Cyperus rotundus* L. and *C. esculentus* L., (both members of subgenus *Cyperus*), have persistent glumes, a feature attributed by Kükenthal (1936) solely to *Cyperus* subgen. *Mariscus*.

From anatomy, physiology, karyology and phytochemistry, information is steadily accumulating that *Mariscus* species are more naturally positioned within *Cyperus* subgenera *Cyperus* and *Pycnostachys* than collectively in a taxon *Mariscus* at either generic or subgeneric rank. O'Neill (1942) stated: 'It is ill-advised to maintain *Mariscus* as a genus when it is very ill-defined even as a subgenus.' Nevertheless, in the present work *Mariscus* is maintained as Natal species are well known under that genus and *Cyperus* is already cumbersome with the greatest number of species in Natal for Cyperaceae as a whole.

In *Mariscus*, the species most likely to be problematical in distinction from *Cyperus* are *M. keniensis* (No. 11)—imperfectly distinct morphologically from *C. distans* (No. 11), and *M. congestus* (No. 4). The last is a wide-spread, common, short-lived perennial or annual, which because of robust, long spikelets that abscise only tardily, is often referred to *Cyperus*. Young plants of all three taxa are similar in general appearance; all may behave as weeds.

Key to species

1a Fertile glumes markedly folded with a prominent wing of tissue developed from keel; vein of keel excurrent into a short mucro; one additional lateral vein present close on either side of keel, glume flanks veinless. Spikelets one-flowered .... 5. *M. cyperoides*
1b Fertile glumes not precisely as for the contrast. Spikelets more than one-flowered, or one-flowered only 2

2a Dwarf annual herbs. Glume with median vein excurrent into a curved arista. Stamen one per floret .... 18. *M. squarrosus*
2b Perennial herbs (occasionally annual under adverse conditions, or appearing annual in early stages of growth, but in these cases not dwarf). Glumes not aristate (occasionally mucronate). Stamens 3 per floret 3

3a Rhizomatous tall perennials (shorter and with more contracted inflorescences at higher altitudes in the Uplands). Leaf blades up to 14.5 mm wide, coarse, with scabrid, cutting margins. Inflorescence anthelate, well branched. Spikelets dark brown, numerous. Growing in moist grassland glades, usually not rooted in visible water, OR in forest as understorey plants, OR as weeds in disturbed wooded, shaded situations .... 17. *M. solidus*
[including *M. drakensbergensis* (No. 6); *M. owanii* (No. 14); *M. grantii* (No. 9); see synopsis of species that follows key]
3b Plants not fitting the requirements of the contrast 4

4a Bases of shoots swollen into pseudobulbs (each pseudobulb consisting of a central, vertical, abbreviated stem surrounded by persistent, slightly thickened leaf bases and having an oval form viewed from the exterior) 5
4b Bases of shoots not formed into pseudobulbs (shoot bases may be swollen into hard, spherical or ovate, often vertically flattened corms, each covered in persistent leaf bases and frequently forming a sympodial uniseriate or irregular series, OR shoots may be without basal enlargement, plants appearing annual 14

5a Glumes with conspicuously recurving apices .... 16. *M. rehmannianus*
5b Glumes lacking conspicuously recurving apices 6

6a Spikelets comprising 3 or more florets 7
6b Spikelets comprising 1 or 2 florets only (occasionally a few spikelets with a third fully formed or rudimentary floret may be present in an inflorescence, but these are always in the minority) 11

7a Spikelets white or green in life (pallid to straw-coloured when dry, but always lacking distinct brown coloration) .. 8. *M. dubius*
[including *M. dregeanus* (No. 7); see synopsis of species that follows key]
7b Spikelets brown, or purple-brown, or reddish, or straw-coloured with distinct brown markings 8

8a Spikelets with 3 florets (occasionally 2, 4 or 5) 9
8b Spikelets with at least 5–6 florets 10

9a Inflorescence a single terminal, apparently unbranched head. Glumes dark brown (plants from Lebombo Mountains) .... 15. *M. pseudovestitus*
9b Inflorescence showing some evidence of branching (either an anthela with 5–9 rays, or more contracted. Glumes reddish brown .... 16. *M. rehmannianus*

10a Glumes mucronate .... 22. *M. vestitus*
10b Glumes without a mucro .... 15. *M. pseudovestitus*

11a Spikelets green in life, straw-coloured or pallid when dry, always lacking reddish, or russet-brown, or maroon coloration 12
11b Spikelets basically cream-coloured but at least some in every inflorescence marked with russet-brown, purple-red, or maroon coloration 13

12a Inflorescence an apparently unbranched head or with contracted branches formed into a multifid head .... 2. *M. capensis*
[see also *M. uitenhagensis* (No. 21) and *M. chersinus* (No. 3)]
12b Inflorescence an open anthela of pedunculate spikes ..... 21. *M. uitenhagensis*
[including *M. chersinus* (No. 3)]

13a Spikelets closely packed on the inflorescence branches, usually slightly ascending ..... 1. *M. albomarginatus*
[see also *M. indecorus* (No. 10)]
13b Spikelets loosely packed on the inflorescence branches, usually patent (spreading) ..... 10. *M. indecorus*
[see also *M. albomarginatus* (No. 1)]
14a Shoot bases swollen into hard, spherical or ovate, often vertically flattened corms seldom exceeding 10 mm in diameter .. 15
14b Shoot bases without apparent basal enlargement, plants appearing annual 19

15a Spikelets comprising more than 3 florets 16
15b Spikelets comprising 1–3 florets only (frequently only 1) 17

16a Inflorescence an open, rayed anthela, or contracted, or reduced to a solitary, short spike. Spikelets densely crowded on inflorescence branches; each spikelet narrowly ovate, compressed ..... 4. *M. congestus*
16b Inflorescence an open, rayed anthela, not contracted or reduced. Spikelets laxly arranged on inflorescence branches; each spikelet linear, hardly compressed ..... 11. *M. keniensis*
[see under *Cyperus distans* (No. 11), p. 56]

17a Spikelets light green in life, pallid or straw-coloured when dry, always lacking brown, russet or reddish coloration .. 20. *M. sumatrensis*
[including *M. sublimis* (No. 19); see synopsis of species that follows key]
17b Spikelets dark green, olive-green or yellow-green in life, fawn or pallid when dry, but these basic colourings overlain by mid-brown, russet or reddish brown on glume flanks 18

18a Glumes with a basic dark green coloration; 8–14, usually 10, lateral veins in each glume flank. Spikelets variable in floret number (1–3) either on same plant, or on plants growing in close association (this showing as variability in spikelet length) ..... 13. *M. macrocarps*
[see *M. macer* (No. 12)]
18b Glumes with a basic olive-green to yellow-green coloration; 6–8 lateral veins in each glume flank. Spikelets predominantly 1-flowered ..... 12. M. *macer*
[see *M. macrocarpus* (No. 13)]

19a Inflorescence an open, branched anthela, or contracted, or reduced to a solitary short spike. Spikelets densely crowded on inflorescence branches; each spikelet narrowly ovate, compressed ..... 4. *M. congestus*
19b Inflorescence an open, branched anthela, not contracted or reduced. Spikelets laxly arranged on inflorescence branches; each spikelet linear, hardly compressed ..... 11. *M. keniensis*
[see under *Cyperus distans* (No. 11) p.56]

1. **Mariscus albomarginatus** *C.B. Clarke* in Conspectus florae africae 5: 590 (1894b) name; C.B. Clarke: 187 (1897/98) description non *Cyperus albomarginatus* K. Schum.: 122 (1895) name illegit.; non Mart. & Schrad. (1842); C.B. Clarke: 387 (1901/02); Podlech: 35 (1967); Vorster: 287 (1978a). Syntypes: Cape Province, between Van Stadens River and Galgebosch, *Burchell 4680* (B, K); Cape Province, between Griquatown and Moses Fontein, *Burchell 2034 (203A?)* (K). Figure 52A, D.

M. inflatus C.B. Clarke: 384 (1901/02). *Cyperus indecorus* Kunth var. *inflatus* (C.B. Clarke) Kük.: 545 (1936); *M. indecorus* (Kunth) Podlech var. *inflatus* (C.B. Clarke) Podlech: 524 (1960).

Icones: Vorster: figs 6, 141, 142 (1978a).

Vouchers: *Goodman 490; Strey & Huntley 5019; C.J. Ward 695, 1795.*

Description: Vorster: 287 (1978a).

Distribution: Coast (north of Durban), Midlands, Maputaland.

Plants relatively short (300–500 mm), leafy, tufted perennials, each shoot swollen into a pseudobulb enveloped in membranous persistent sheaths that may become slightly fibrous. Inflorescence, a contracted anthela of 3–5 (–9) short rays, carries 1(–2)-flowered, rather densely packed straw-coloured to russet-red-brown spikelets that are generally upwardly directed at angles less than 90°. Favoured habitats are sunny situations in open, often disturbed, grassland or scrubland where substrate is sandy or stony. From Maputaland, Vorster (1978a) reports a more robust phase (plants taller with a larger number of longer spikes in inflorescence), but differences are quantitative and gradual (*Vorster 2616, 2633*).

Relationship is with *M. indecorus* (No. 10) in which the spikelets are less closely packed upon the axis of the spike and patent (at approx. 90°) rather than upwardly directed, with longer spikelets and glumes: but these dimensions are not divisive; they grade from *M. albomarginatus* (representative of the lower section) to *M. indecorus* (upper section).

At present, the two species are tentatively maintained for Natal. Intensive field work in certain areas and breeding experiments are needed for confirmation.

2. **Mariscus capensis** *(Steud.) Schrad.*, Analecta ad floram capensem 1. Cyperaceae: 13 (1832b); Nees: 520 (1832); Nees: 139 (1835); Kunth: 122 (1837); C.B. Clarke: 186 (1897/98); Podlech: 36 (1967); Vorster: 272 (1978a); P.L. Forbes: 55 (1987b). Type: Cape Province, ohne bekannte Angabe des Standortes, *Von Ludwig s.n.* (*Ludwig 266*) (presumed destroyed). Transvaal, Rustenburg Nature Reserve, *Vorster 2653* (PRE, neo.; K, LE, MO, STE, isoneo.) [see Vorster: 448, (1978b)]. Figure 52B, E.

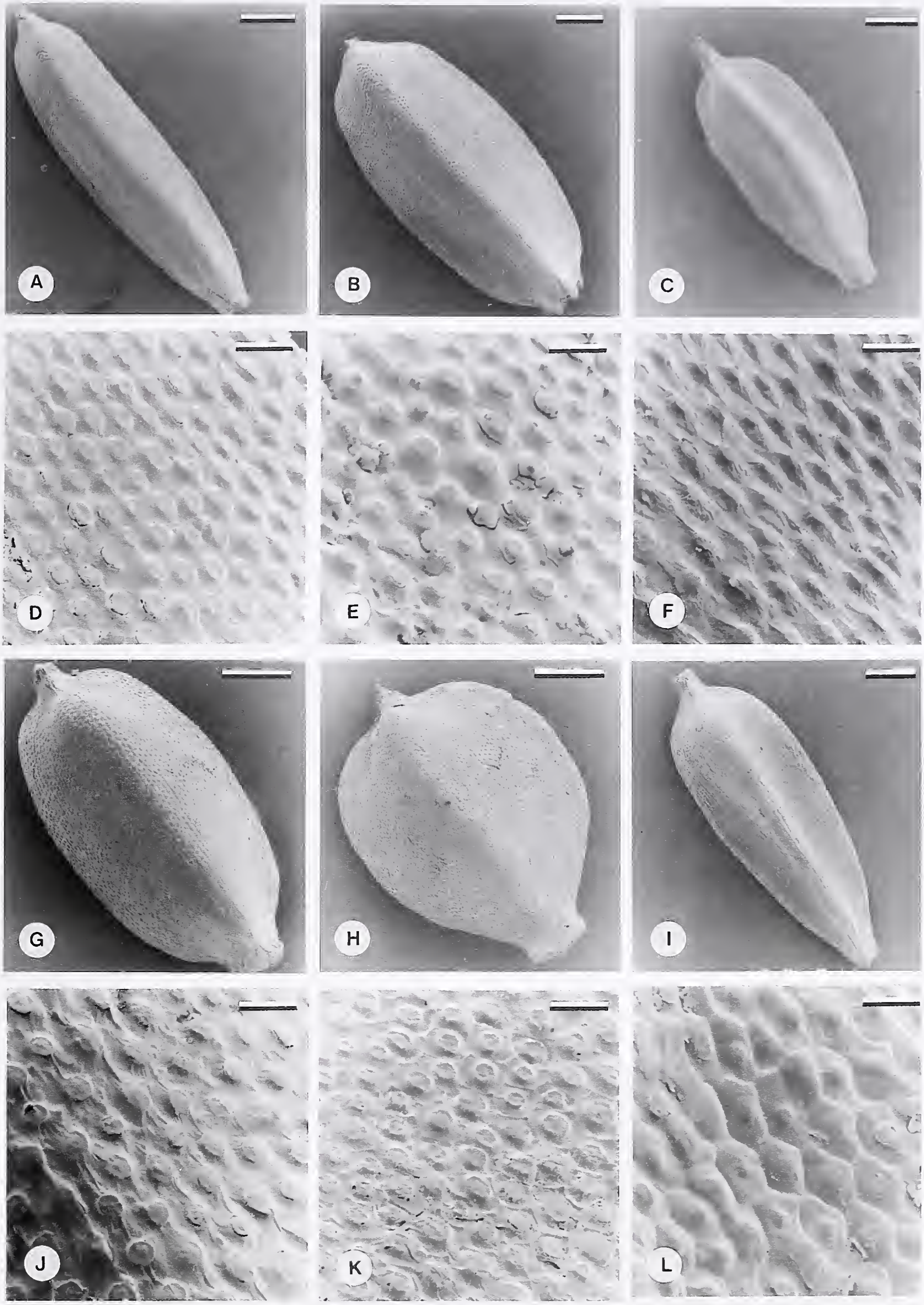

FIGURE 52.—*Mariscus*. A, D, *M. albomarginatus*, *Strey & Huntley 5019*; B, E, *M. capensis*, *Moll 4665*; C, F, *M. congestus*, *Crewe 55*; G, J, *M. dregeanus*, *Moll 4822*; H, K, *M. dubius*, *J. Browning 259*; I, L, *M. owanii*, *Hilliard & B.L. Burtt 8472*. Scale bars: A–C, G–I, 250 µm; D–F, J–L, 25 µm.

Kyllinga capensis Steud.: 153 (1829). *Cyperus capensis* (Steud.) Endl.: 94 (1842); Boeck.: 378 (1869/70); Kük.: 539 (1936) excluding atypical vars; Vorster: 448 (1978b).

M. capensis auct. non Schönland: 29 (1922); Cherm.: 336 (1935); Podlech: 33 (1967).

Icones: Vorster: 6, 128, 129 (1978a); non Schönland: t. 20 (1922).

Vouchers: *T.H. Arnold 819; Moll 3409, 4665; Vorster 2446, 2476, 2495.*

Description: Vorster: 272 (1978a).

Distribution: widespread, but scattered.

Plants tufted, leaf-bearing perennials; shoot bases swollen into pseudobulbs covered in persistent dark brown sheaths; growing in inhospitable, bare, or sparsely covered, situations rooted in shallow soil often over rock. Light intensities are high. Inflorescences are heads (sometimes branched, but inconspicuously so, since the closely packed green to orange tinted, never reddish or brownish, spikelets (straw-coloured to pallid when dry), completely hide the short axes. Spikelets one-flowered. This is the main character linking *M. capensis* with *M. uitenhagensis* (No. 21) and *M. chersinus* (No. 3). In the two latter taxa, inflorescences take the form of an anthela, the rays more numerous (7–11) and longer in *M. chersinus* than in *M. uitenhagensis* (rays 4–6). *M. capensis* is also similar to *M. dregeanus* (No. 7) in general facies, but this last species has 3–5-flowered spikelets [see *M. dubius* (No. 8)].

3. **Mariscus chersinus** *N.E. Br.* in Kew Bulletin 1921: 300 (1921); Vorster: 259 (1978a); Vorster: 444 (1981). Syntypes: Botswana, Ngamiland, Kwebe Hills, *Lugard 142* (GRA, K); Mochudi, *Rogers 6310* (BOL, J, K).

Cyperus chersinus (N.E. Br.) Kük.: 525 (1936).

C. bullatus Kük.: 198 (1931); Kük.: 538 (1936). *M. bullatus* (Kük.) Podlech: 523 (1960); Podlech: 36 (1967). Type: South West Africa (Namibia), Tiefer Sand im Hyphaene-wald, *Dinter 2354* (B, holo.).

C. capensis (Steud.) Endl. var. *polyanthemus* Kük.: 540 (1936). Type: Mozambique, Lourenço Marques (Ressano Garçia), an sandigen Stellen, *Schlechter 11685* (B, G, Z).

Icones: Vorster: figs 6, 116, 117 (1978a); Vorster: fig.: 13 (1981).

Vouchers: *Moll 4622; Vorster 2637* (PRE).

Description: Vorster: 259 (1978a).

Distribution: Maputaland.

Plants medium-sized, leaf-bearing, slenderly tufted perennials. Each shoot is swollen basally into a poorly developed pseudobulb. Inflorescences are anthelas with well-developed rays that carry terminally, spikes of 1 (rarely 2)-flowered, greenish, straw-coloured or very light brown spikelets. Habitat is open savanna; substrate usually sandy. There is close relationship with *M. uitenhagensis* (No. 21), but plants of *M. chersinus* are larger with longer rays and a different method of propagation in that innovations develop outside the pseudobulb instead of within a leaf sheath. There is also a different distribution, *M. chersinus* being frequent in northern Namibia, through Botswana to southern Mozambique, just reaching Maputaland, whereas *M. uitenhagensis* is concentrated in the Transvaal, the Orange Free State, Swaziland, the Midlands and Uplands of Natal, Lesotho and the eastern Cape. Further study may reveal that *M. chersinus* is the tropical phase of *M. uitenhagensis*.

4. **Mariscus congestus** *(Vahl) C.B. Clarke* in Conspectus florae africae 5: 553 (1894b); C.B. Clarke: 191 (1897/98); Domin: 436 (1915); Schönland: 31 (1922); Podlech: 36 (1967); Vorster: 199 (1978a); P.L. Forbes: 55 (1987b); Hilliard: 55 (1987); Hilliard & B.L. Burtt: 113 (1987). Type: 'Cap. B. spei' (C?) no specimen yet traced. Figure 52C, F.

Cyperus congestus Vahl: 358 (1805); Schrad.: 9 (1832b); Nees: 136 (1835); Kunth: 87 (1837); Steud.: 46 (1855); Boeck.: 347 (1869/70); C.B. Clarke: 182 (1884); Kük.: 444 (1936).

M. congestus (Vahl) C.B. Clarke var. *glanduliferus* C.B. Clarke: 553 (1894b) name; C.B. Clarke: 192 (1897/98). *C. congestus* Vahl var. *glanduliferus* (C.B. Clarke) Kük.: 446 (1936). Syntypes: Natal, without precise locality, *Buchanan 315* (K); Cape Province, Grahamstown, *MacOwan 496* (BOL, GRA, K, SAM).

M. cooperi C.B. Clarke: 586 (1894b) name; C.B. Clarke: 197 (1897/98) descr. *C. cooperi* (C.B. Clarke) K. Schum.: 328 (1898). Type: Natal, without precise locality, *Cooper 3333* (K).

C. congestus Vahl var. *grandiceps* Kük.: 446 (1936). *M. congestus* (Vahl) C.B. Clarke var. *grandiceps* (Kük.) Podlech: 523 (1960). Syntypes: South West Africa (Namibia), 'Quellsumpf bei Okozongominja', *Dinter 1781* (SAM); Cape Province, Grahamstown, Hügel ober dem Hospital, *Daly & Cherry 923* (PRE); Transkei, Pondoland, *Bachmann 90* (B).

C. congestus Vahl var. *pseudonatalensis* Kük.: 446 (1936); Podlech: 523 (1960). Syntypes: South West Africa (Namibia) 'Quellsumpf bei Okozongominja, *Dinter 1747* (SAM). Botswana, 'Grasige Stellen bei Kachun', *Marloth 1028* (B). Lesotho, Leribe, *Dieterlen 209* p.p. (K, PRE, SAM, STE). Transkei, Baziya, *Baur 360* (SAM). Cape Province 'Ramondsdrift am Orange-Rivier', *Schlechter s.n.* (K).

Icones: Vorster: figs 6, 66, (1978a); Davis in Hilliard: 55 (1987).

Vouchers: *T.H. Arnold 403, 863; Bayer & McClean 21; K.D. Huntley 466; C.J. Ward 1230.*

Description: C.B. Clarke: 191 (1897/98); Vorster: 200 (1978a).

Distribution: widespread.

M. congestus is a species of damp streambanks, moist depressions in grassland, the margins of temporary water bodies, drainage ditches, or plants may be weeds of disturbed natural areas, or of cultivation. They appear annual in the first year of growth and flowering, but there is generally die-back of the aerial organs and development of a small tuft from the persistent rootstock with return of favourable conditions.

Because of the many-flowered, rather robust spikelets and the tardy disarticulation of the spikelet rachilla from the spike axis, specimens are often associated with *Cyperus* and sometimes misidentified as *C. distans* (including *Mariscus keniaeensis*); but inflorescences of *M. congestus* are, as the specific epithet indicates, more contracted and far less lax, the spikelets wider and much less dainty. Under poor growth conditions, plants may be depauperate with the inflorescence reduced to a single terminal spike (a solitary head). Such plants are difficult to identify because they contrast markedly in general appearance with better grown examples.

Many infraspecific taxa have been established to accommodate the range of variability that exists, not only in Natal, but in the drier western areas of southern Africa.

Var. *brevis* (Boeck.) C.B. Clarke (1897/98) (basionym *Cyperus brevis* Boeck. 1869/70) which accommodates examples with inflorescences contracted into heads, was incorrectly cited under *M. congestus* (Ross 1972). In this work it is placed under *Cyperus natalensis* Hochst.

M. congestus has a distribution through Europe and the Middle East; also Australia, where perhaps it was originally an introduction. Strangely it seems almost absent from tropical Africa.

5. **Mariscus cyperoides** *(Roxb.) A. Dietr.*, Linné species plantarum editio sexta 2: 438 (1832/33). Type: from India.

Kyllinga cyperoides Roxb.: 182 (1832). *Courtoisia cyperoides* (Roxb.) Nees; 286 (1833); Nees: 92 (1834a); Kunth: 127 (1837); Steud.: 71 (1855); Boeck.: 335 (1861); Boeck.: 434 (1867/68); C.B. Clarke: 596 (1894b); C.B. Clarke: 404 (1901/02); Vorster: 257 (1977) non *Cyperus cyperoides* (L.) Kuntze (1898).

subsp. *cyperoides*

A slender medium-sized, annual, leaf-bearing herb with a compound anthelate inflorescence bearing 1-flowered spikelets that are markedly compressed. Glumes winged. From India and Burma.

subsp. **africanus*** *(C.B. Clarke ex Kük.) Podlech* in Mitteilungen der Botanischen Staatssammlung, München 3: 523 (1960); Podlech: 37 (1967). Syntypes: Kükenthal (1936) listed 14 specimens from tropical Africa, Rhodesia and Madagascar. [Vorster (1978a), selected East Africa, Mahenge, *Schlieben 2389 B*, lecto., ined.] Figure 53.

Cyperus pseudokyllingioides Kük. var. *africanus* (C.B. Clarke) Kük.: 501 (1936). *Courtoisia cyperoides* (Roxb.) Nees var. *africana* C.B. Clarke: 596 (1894b) name only.

Courtoisia cyperoides (Roxb.) Nees var. *spicata* C.B. Clarke: 996 (1904) name only; Schönland: 32 (1922) name only.

Icones: Schönland: t. 25 (1922) as *Courtoisia cyperoides* var. *spicata*; Vorster: figs 6, 163, 164 (1978a).

Voucher: *Vorster 2702*.

Description: Vorster: 315 (1978a).

Distribution: Maputaland (Mkuze Game Reserve).

The subspecific distinction is necessitated as the African plants are said to differ from the typical phase in the presence of an outwardly curving mucro hardly longer than 0.5 mm.

Plants grow as slender annuals in wet mud bordering freshwater pans.

M. cyperoides differs from all other Natal species of *Mariscus* in its glume structure (keel is winged with lateral nerve of each face located close to keel) and in the tardy abscission of the two basal sterile glumes from axis of spike. Spikelet also strongly compressed. There is relationship with the more tropically distributed *M. assimilis* (Steud.) Podlech which differs in the spikelets being 5–9-flowered.

These two taxa have been placed in *Kyllinga* and in *Cyperus* where they do not conform. They are better known under *Courtoisia* Nees non Marchand, but this name in Cyperaceae needs conservation against *Courtoisia* Marchand (Lichenes), see Addendum.

Note: *Mariscus cyperoides* is an unfortunate name in view of *Cyperus cyperoides* (L.) Kuntze (1898), which is the earliest name available under *Cyperus* for the weedy and widely distributed *Mariscus sumatrensis* (Retz.) J. Raynal (= *M. sieberianus* Steud.) (see No. 20).

6. **Mariscus drakensbergensis** *Vorster* [see No. 17, *M. solidus* (Kunth) Vorster].

7. **Mariscus dregeanus** *Kunth* [see No. 8, *M. dubius* (Rottb.) Kük. ex C.E.C. Fisch.]. Figure 52G, J.

8. **Mariscus dubius** *(Rottb.) Kük. ex C.E.C. Fisch.*, Cyperaceae, in J.S. Gamble, Flora of the Presidency of Madras 9: 1644 (1931c) [see note by Vorster: 234 (1978a)]; Podlech: 524 (1960); Podlech: 37 (1967);

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* See addendum.

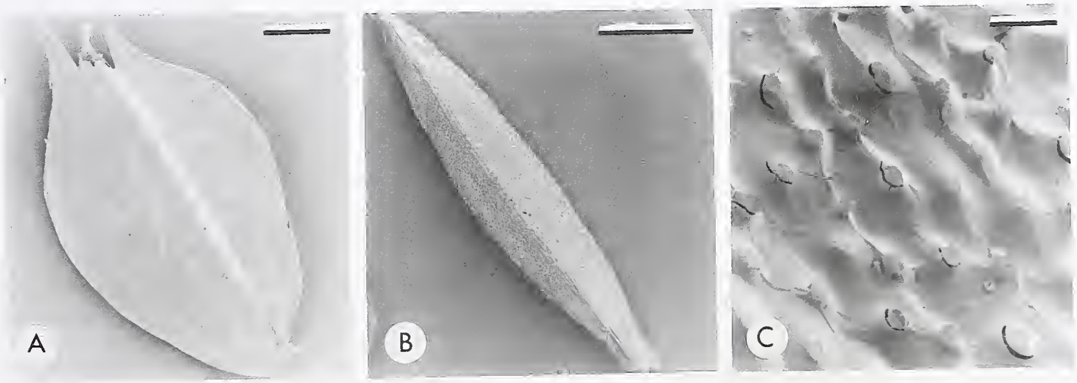

FIGURE 53.—*Mariscus*. A, B, C, *M. cyperoides* subsp. *africanus*, *Schweickerdt 2187*. A, glumes; B, achene; C, achene surface. Scale bars: A, B, 500 µm; C, 25 µm.

Vorster: 234 (1978a). Type: India, Malabar, *Koenig s.n.* (C, K). Figures 52H, K; 54.

Cyperus dubius Rottb.: 20 (1773); Boeck.: 336 (1869/70); C.B. Clarke: 285 (1883a); C.B. Clarke: 197 (1884); Ridl.: 133 (1884); Kük.: 563 (1936); R.W. Haines & Lye: 221 (1983).

C. coloratus Vahl: 312 (1805). Type: Guinea, *Thonning s.n.* (C).

C. kyllingaeoides Vahl: 312 (1805); Kunth: 94 (1837); Steud.: 50 (1855). Type: Asia, 'Indiae orientalis', *Koenig s.n.* (BM, C).

M. kraussii Hochst.: 756 (1845); Cherm.: 24 (1936/37). Type: Natal, Inter arundines ad fl. Umlaas, *Krauss 6* (G, M, Z).

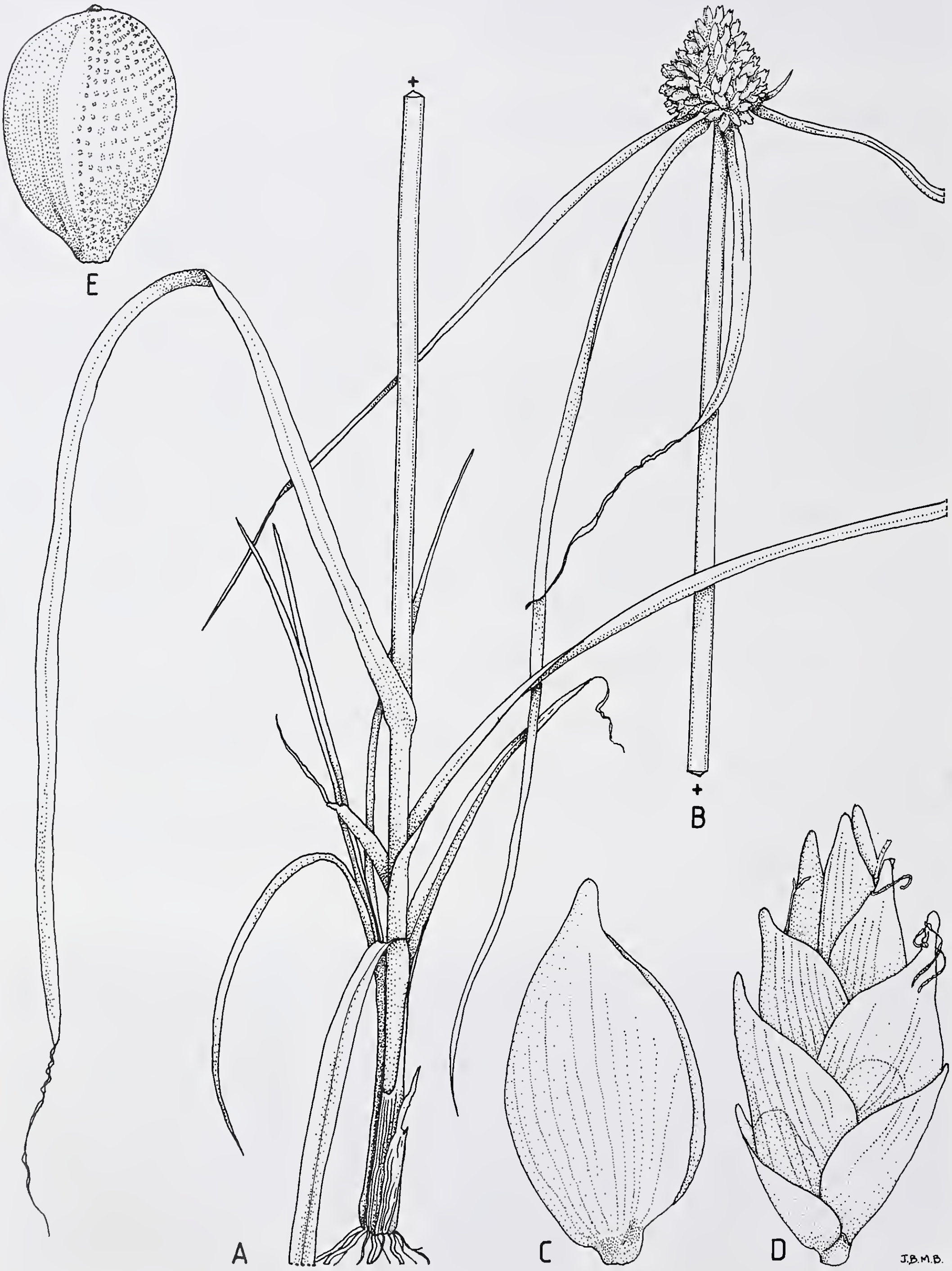

FIGURE 54.—*Mariscus dubius, J. Browning 259.* A, plant base with severed culm, × 1; B, culm and inflorescence, × 1; C, glume, lateral view, × 20; D, spikelet, × 12; E, achene, × 35.

There are many other synonyms not included here since they mostly apply to the species in Madagascar and Asia.

Icones: Rottb.: t. 4, fig. 5 (1773); Vorster: figs 6, 95, 96 (1978a); R.W. Haines & Lye: figs 449, 450 (1983).

Vouchers: *Goodman 489; Moll 3119, 4813; Vorster 2625, 2640, 2716* (all PRE); *C.J. Ward 544, 4143, 4585, 6166, 6496; M.C. Ward 1840.*

Description: R.W. Haines & Lye: 221 (1983); Vorster: 236 (1978a).

Distribution: Coast, Midlands, Zululand, Maputaland.

Mariscus dubius is a problematical species. In its typical phase, plants short to medium-sized, tufted, leaf-bearing perennials with shoot bases expanded to pseudobulbs with outermost leaf sheaths membranous and pinkish to fawn-brown. Inflorescence solitary, or sparsely branched, contracted head of 6–10-flowered, compressed spikelets with white to off-white, slightly succulent glumes. Occupy open situations, often in sand, in full sunlight (occasionally partial shade) growing as ruderals or weeds. Distribution in Natal, is predominantly coastal (including whole of Maputaland) but extends inland to Pietermaritzburg, Richmond and Howick (Midlands).

Often associated with such typical plants are others, similar in general growth form and habitat preferences, but with inflorescences more markedly branched and irregular in outline and appearing to comprise a larger number of smaller spikelets, greenish not milk-white, less compressed and only 3–5-flowered. This second phase agrees with the type of Kunth's species, *M. dregeanus*. Good representative examples of these two phases are distinctive; however, they are linked by others not readily related to either extreme and differently interpreted by different observers.

Vorster (1978a, 1981) held the opinion that the typical phase (*M. dubius*) is distinguishable from the second phase (*M. dregeanus*) and provided criteria by which he claimed the two species could be segregated. In practice, his criteria are not convincingly divisive, and in Natal at least, there are specimens that are not readily placed. The alternative opinion (that of interpreting *M. dregeanus* as a synonym of *M. dubius*) has been much followed by earlier authors and has been adopted by Koyama (1985). It is not entirely satisfactory either, because it implies conspecificity based on morphological conformity that does not really exist. Personally, I hold a third opinion (at present purely speculative, and arising from study only in southern Africa) that *M. dubius, M. capensis* (No. 2) and *M. dregeanus* represent an interrelated plexus (*M. dregeanus* incorporating products of hybridisation and back-crossing derived from the other two species as putative original parents). The three taxa should be investigated karyologically and reproductively before further attempts are made to treat them systematically. Supporting evidence for this view cannot be entered into here, except to state that monstrous growth of spikelets and vegetative proliferation of the inflorescence are relatively frequently observed phenomena within the limits of the plexus. In the present work, it seems most suitable and convenient to include *M. dregeanus* within the limits of *M. dubius*. Those who would refine relationship further are referred to the work of Vorster (1978a, 1981). Two further criteria not considered by this author may perhaps have some bearing on the differentiation of *M. dubius* from *M. dregeanus*, namely, number of spikelets per inflorescence, and the nature of the glume apex (mucronate in *M. dregeanus*; mucro hardly developed, apex thick, stout in *M. dubius*).

Note: Vorster (1978a) cites *Wright 2028* (Kamberg) under *M. dregeanus* which increases the distributional range for that taxon to the Uplands. The following are specimens representative of phase two (*M. dregeanus*):

Vouchers: *T.H. Arnold 813* (PRE); *Moll 2374, 4822; Vorster 2713, 2638* (PRE); *C.J. Ward 684, 743, 2879.*

9. **Mariscus grantii** *C.B. Clarke* [see *Mariscus solidus* (No.17)].

10. **Mariscus indecorus** *(Kunth) Podlech* in Mitteilungen der Botanischen Staatssammlung, München 3: 524 (1960); Podlech: 37 (1967); Vorster: 276 (1978a). Type: Cape, Cap. b. spei, *Drège s.n.* G (see note by Vorster 1978a).

Cyperus indecorus Kunth: 85 (1837); Steud.: 45 (1855); Kük.: 543 (1936).

C. indecorus Kunth var. *namaquensis* Kük.: 545 (1936). *M. indecorus* (Kunth) Podlech var. *namaquensis* (Kük.) Podlech: 524 (1960). Syntypes:: South West Africa (Namibia), *Dinter 1184* (B), *Schafer 372* (B); Aris, Dist. Bethanien, *Range 1275* (SAM).

M. albomarginatus C.B. Clarke var. *binucifera* C.B. Clarke: 187 (1897/98). *M. binucifer* (C.B. Clarke) C.B. Clarke: 13 (1908). Type: Cape Province, Pondoland, St Johns River, *Schlechter 6433* (B, GRA, K, Z).

M. capensis auct.: Podlech: 36 (1967) non (Steud.) Schrad.

Icones: Vorster: figs 6, 131, 132, 144, 145 (1978a).

Vouchers: *Acocks 9937* (PRE); *T.H. Arnold 809* (PRE); *K.D. Huntley 236; C.J. Ward 1803, 2432.*

Description: Vorster: 276 (1978a).

Distribution: Coast (north of Durban), Midlands, N Natal, Uplands, Zululand, Maputaland (apparently absent from the south coast and southern inland areas: it should be looked for).

Mariscus indecorus differs from *M. albomarginatus* (No. 1) in the arrangement of spikelets on the spikes of the anthelate inflorescence (loosely packed, patent in the former; close-packed, upwardly inclined in the latter) and in the longer spikelets and glumes of *M. indecorus* (but there is overlap in these parameters). These criteria are not reliably divisive, but both species are maintained (following Vorster 1978a) until a more comprehensive study involving field work in areas like Wartburg (Kings Halt) and Kingscliffe, as well as investigations into methods of reproduction are possible.

Vorster (1978a) cites two Natal specimens, *Vorster 2701* PRE (Mkuzi Game Reserve), and provisionally only, *T.H. Arnold 812* PRE (Wartburg) as *M. indecorus* var. *namaquensis*; varietal status being based on the shorter spikelets and glumes. Varieties within *M. indecorus* are not upheld here, for reasons that will be given under *M. rehmannianus* (No. 16), with which there is also relationship.

11. **Mariscus keniensis** (*keniaeensis*) *(Kük.) S.S. Hooper* (see under *Cyperus distans*, p. 56).

12. **Mariscus macer** *Kunth*, Enumeratio plantarum 2: 121 (1837); C.B. Clarke: 589 (1894b); C.B. Clarke: 190 (1897/98); C.B. Clarke: 329 (1901/02) p.max.p.; Podlech: 113 (1961); Vorster: 186 (1978a); P.L. Forbes: 55 (1987b). Type: Cape, Cap. b. spei, *Drège 4449* (B, holo.).

Cyperus cylindrostachys Boeck.: 383 (1869/70) p.min.p., *Drège 4449* (B). *C. macer* (Kunth) K. Schum.: 122 (1895) non C.B. Clarke (1884).

M. pseudoflavus C.B. Clarke: 591 (1894b) nom. nud. *C. macrocarpus* (Kunth) Boeck. var. *pseudoflavus* C.B. Clarke ex Kük.: 529 (1936). *C. cyperoides* (L.) Kuntze subsp. *pseudoflavus* (Kük.) Lye 3: 231 (1983a); R.W. Haines & Lye: 205 (1983).

Icones: C.B. Clarke: t. 25, figs 8, 9 (1909) as *Mariscus pseudoflavus* C.B. Clarke; Vorster: figs 6, 53, 54 (1978a); R.W. Haines & Lye: fig. 410 (1983) as *Cyperus cyperoides* (L.) Kuntze subsp. *pseudoflavus* (Kük.) Lye.

Vouchers: *Most 57; Vorster 2481, 2499* (both PRE).

Description: Vorster: 186 (1978a).

Distribution: Coast, Zululand, Maputaland.

M. macer, together with its close relatives *M. macrocarpus* Kunth and *M. sumatrensis* (No. 20), are recognised by the shoot base, which is not a soft pseudobulb but a hard, almost spherical, cormose swelling seldom wider than 10 mm and enveloped in persistent papery, often purplish, leaf sheaths. Older plants develop a sequence of such bases. Inflorescences also predominantly green. *M. sumatrensis* further distinguished by its behaviour as a weed (it is suspected of having been introduced to southern Africa, and to my knowledge does not occur in Natal as a component of natural vegetation).

M. macer and *M. macrocarpus* are slender to sparsely tufted perennials growing, invariably in sand, along entire Natal coastline usually in association with dune forest, either on margins in full sunlight, or in open glades in partial shade. Occasionally found slightly inland in coastal grassland.

Floret number per spikelet is predominantly 1 in *M. macer*, 1–3 in *M. macrocarpus*. The only other significant difference is in the number of lateral veins in the flanks of the glumes: 6–8 in *M. macer*, 10 in *M. macrocarpus*; also differences in robustness of plants and of inflorescences (larger and 'heavier' in *M. macrocarpus*). Qualification is necessary, however, since in *M. macrocarpus* there is often, within an individual inflorescence, a range of spikelets, some short and few-flowered, others much longer and 'heavier', giving evidence of becoming monstrous and undergoing vegetative proliferation.

Many authorities, including Haines & Lye (1983) distinguish *M. macer, M. macrocarpus* and *M. sumatrensis* only at infraspecific level and then doubtfully, for they state 'The different subspecies and varieties may ... be difficult to separate.' In the present work the three species are treated separately. *M. sumatrensis* probably requires distinction; the other two are intimately connected and recognised as different only until karyological and reproductive study provides evidence that may support the supposition that *M. macrocarpus* is in some way an 'elaboration' derived from *M. macer* (polyploid? apomict?).

13. **Mariscus macrocarpus** *Kunth*, Enumeratio plantarum 2: 120 (1837); Steud.: 61 (1855); C.B. Clarke: 589 (1894b); C.B. Clarke: 190 (1897/98); Vorster: 192 (1978a). Type: South Africa, ora orientalis, *Drège 4421* (B, holo.) [see Boeck.: 380 (1869/70)].

Cyperus macrocarpus (Kunth) Boeck.: 380 (1869/70); Kük.: 528 (1936). *C. cyperoides* (L.) Kuntze var. *brevispicatus* Kük.: 517 (1936) (only as to *Schlechter 12137*, B, BRUX, E, G, L, S). *C. cyperoides* subsp. *macrocarpus* (Kunth) Lye: 231 (1983a); R.W. Haines & Lye: 205 (1983).

M. radiatus Hochst.: 757 (1845) non *C. radiatus* Vahl (1805); Steud.: 61 (1855); C.B. Clarke: 591 (1894b); C.B. Clarke: 190 (1897/98). *C. kraussii* Boeck.: 379 (1869/70). *C. macrocarpus* (Kunth) Boeck. var. *kraussii* (Boeck.) Kük.: 528 (1936). Type: Natal, Ad ripas fl. Umlaas, *Krauss 35* (B, G, MO).

C. luzuliformis Boeck.: 356 (1869/70). *M. luzuliformis* (Boeck.) C.B. Clarke: 589 (1894b); C.B. Clarke: 191 (1897/98).

M. angularis Turrill: 69 (1925). Type: Cape Province, Port St Johns, *Schönland 3848* (GRA, holo.).

Icones: C.B. Clarke: t. 22, fig. 5 (1909) as *M. radiatus*; Vorster: figs 6, 58, 59 (1978a); R.W. Haines & Lye: fig. 411 (1983).

Vouchers: *Strey & Huntley 5024* (PRE); *Vorster 2462, 2634* (PRE); *C.J. Ward 731, 747, 4591, 6077, 6167.*

Description: Vorster: 192 (1978a).

Distribution: Coast, Maputaland.

M. macrocarpus is very closely related to *M. macer*, under which species it is considered (see No. 12).

14. **Mariscus owanii** *(Boeck.) C.B. Clarke* (see No. 17, *M. solidus*). Figure 52I, L.

15. **Mariscus pseudovestitus** *C.B. Clarke*, Cyperaceae, in Bulletin de l'Herbier Boissier, Sér. 2, 6: 709 (1906a); C.B. Clarke: 13 (1908); Schönland: 30 (1922); Vorster: 226 (1978a). Syntypes: Natal, Claremont, *Schlechter 3145* (K, B, G, GRA, M, MO, Z); Maritzburg, *Schlechter 3310* (Z); Umbilo Flum., *Rehmann 8443* (K, Z). Note: another syntype from Cape, Grahamstown, *Daly 669* (K) is in question and should probably be excluded. Vorster 1978a states that *Daly 669* (GRA) is a *Euphorbia*, a name also given to No. *669* in Daly's collector's notebook. Figure 55A, D.

Cyperus pseudovestitus (C.B. Clarke) Kük.: 547 (1936); R.W. Haines & Lye: 212 (1983).

Kyllinga hymenopoda A. Peter: 47 (1928). Type: Tanzania, Useguha in den Salzlagunen zwischen Buyuni und Saadani, *Peter 14588* (B).

M. vestitus sensu C.B. Clarke: 188 (1897/98) p.p.

Icones: Vorster: figs 6, 86, 87 (1978a); R.W. Haines & Lye: fig. 427 (1983).

Vouchers: *Johnstone 567; Moll 2144, 2475; Pooley 159; Tinley 341; C.J. Ward 1614, 1654, 2748, 5069, 7272; M.C. Ward 1788.*

Description: Vorster: 226 (1978a); R.W. Haines & Lye: 212 (1983) as *Cyperus pseudo-vestitus.*

Distribution: Coast, Midlands, Zululand, Maputaland.

Plants tufted, leaf-bearing, sun-tolerating perennials, with shoot bases developed into pseudobulbs sheathed by

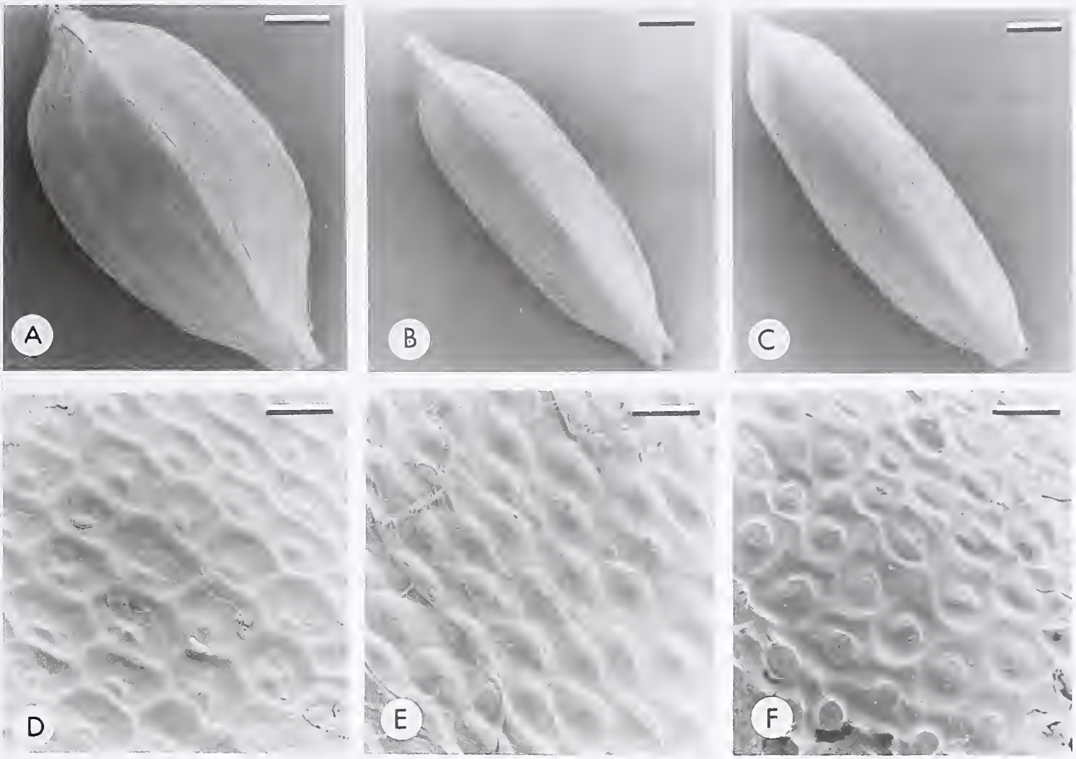

FIGURE 55.—*Mariscus*. A, D, *M. pseudovestitus*, *Ward 5069*; B, E, *M. solidus*, *Ward 564*; C, F, *M. sumatrensis*, *J. Browning 326*. Scale bars: A–C, 250 µm; D–F, 25 µm.

purple-brown to black, dull or glossy leaf sheaths; growing in exposed, open situations in shallow soil, often overlying rock, or at coast, in short grassveld on sand, or in bare sand.

Inflorescences variable, from a branched anthela with 2–5 rays, to a contracted head. Spikelets strongly compressed, 3–7-flowered, with glumes white proximally, russet-brown or maroon-red distally, flanks with well-marked longitudinal nerves.

There is close relationship with *M. vestitus* (No. 22.). Distinction is most reliably ensured by examination of the glume apices (the midvein not excurrent in *M. pseudovestitus*, but developed into a short, distinct mucro in *M. vestitus*). Vorster (1978a: 222, table 6.7) tabulated other differences, but they show overlap and are not convincingly divisive.

Plants grow on summit of Lebombo Mountains (*Vorster 2497* PRE). From these plants, Vorster (1978a) has segregated other specimens from approximately the same locality (*Nel 181, Vorster 2723, Strey & Moll 3650, Crawford 259, Venter 5189, Downing 619*; all PRE) as a distinct species, *M. lebomboensis* Vorster *ined.* Differences are based on the inflorescence (an unbranched head), narrower, less compressed spikelets, longer glumes and narrower fruits. However, these parameters are merely part of the range for *M. pseudovestitus* and do not provide adequate means of separation. Pending further study, these somewhat atypical examples are here included within *M. pseudovestitus*.

16. **Mariscus rehmannianus** *C.B. Clarke* in Conspectus florae africae 5: 591 (1894b) nom. nud., C.B. Clarke: 196 (1897/98); Vorster: 280 (1978a); P.L. Forbes: 55 (1987b). Syntypes: Transvaal, lagoon near the Pinaars (Pienaars) River, *Nelson 13* (K); Pretoria, *Rehmann 4479* (K). Without precise locality, *Holub s.n.*

Cyperus rehmannianus (C.B. Clarke) K. Schum.: 328 (1898) without description, non *C. rehmannianus* (C.B. Clarke) Boeck. ex Kuntze (1898) based on *Pycreus rehmannianus* C.B. Clarke.

M. vestitus (Hochst.) C.B. Clarke var. *decurvata* C.B. Clarke: 134 (1906b). *C. indecorus* Kunth var. *decurvatus* (C.B. Clarke) Kük.: 545 (1936). *M. indecorus* (Kunth) Podlech var. *decurvatus* (C.B. Clarke) Podlech: 524 (1960). Type: Mozambique, Ressano Garçia, *Schlechter 11952* (B, BOL, BRUX, G, GRA, PRE, Z).

C. indecorus Kunth var. *dinteri* Kük.: 545 (1936). *M. indecorus* (Kunth) Podlech var. *dinteri* (Kük.) Podlech: 524 (1960). Type: South West Africa (Namibia), Farm Hoffnung, *Dinter 2724* (B, SAM).

Icones: Vorster: figs 6, 134, 135 (1978a).

Vouchers: *Brown & Shapiro 438a* (PRE); *O. Letley s.n.*

Description: Vorster: 280 (1978a).

Distribution: N Natal, Zululand (Umfolozi Game Reserve).

In its most distinctive form with glume apices conspicuously recurved, *M. rehmannianus* is easily identified. However, such plants are not common in Natal, being known only from the north where the tufted, medium-sized, leaf-bearing perennials favour dry, open areas where there is little competition. Shoot bases are developed into pseudobulbs with swelling of leaf sheaths. Because of its characteristic inflorescence due to the long spikelets, (2–5-flowered) and long recurved glume apices, the species is maintained here, pending further study. It is intimately a part of the plexus formed by *M. albomarginatus* (No. 1) and *M. indecorus* (No. 10) and should be investigated with them to determine, if possible, factors governing its peculiar elaboration. According to parameters provided by Vorster (1978a) for the species in southern Africa (not Natal alone), there are continuous size gradients for *M. albomarginatus, M. indecorus* (including var. *namaquensis*) and *M. rehmannianus* for spikelet and glume dimensions. All have in common, similar reddish pigmentation of the glumes (slightly purplish in *M. indecorus*), a narrow, often curved achene and well-developed sclerenchymatous strands in the leaves. Known distribution patterns are not discordant with the concept of a continuous plexus.

17. ***Mariscus solidus** *(Kunth) Vorster* in South African Journal of Botany 52: 265 (1986c). Type: Cape, ora orientalis Africae australis, Coloniam inter et Port Natal, *Drège 4410* (B, lecto, designated Vorster 1986c). Figure 55B, E.

Cyperus solidus Kunth: 76 (1837). *C. solidus* Kunth var. *elatior* Kunth: 76 (1837). *C. elatior* (Kunth) Boeck.: 327 (1869/70). *Mariscus elatior* (Kunth) C.B. Clarke: 587 (1894b); C.B. Clarke: 194 (1897/98).

C. ligularis sensu Thunb.; 18 (1794); Thunb.: 100 (1823) non L. (1759).

C. congestus Vahl var. α Nees: 137 (1835). Syntypes: Cape, In districtu Caledon, *Ecklon s.n.*; in sylvis primaevis 'Krakakammae', *Ecklon s.n.* (B).

C. dactyliformis Boeck.: 329 (1869/70); Kük.: 433 (1936). Type: Cape, Prom. bon spei [Zwartkopsrivier], *Zeyher 15* [B, lecto., designated Vorster (1986)].

M. gueinzii C.B. Clarke: 588 (1894b) nom. nud.; C.B. Clarke: 195 (1897/98). Syntypes: Natal, near Durban, *Wood 4098* (BOL, K, NH); *Buchanan 130* (K); Port Natal, Sept. 1891, *Gueinzius s.n.* (K). Cape, Zwartkops River, *Burchell 4431* (K, PRE); *Zeyher 15* (B); Komgha Division, *Flanagan 977* (BOL, PRE, SAM).

M. owanii sensu C.B. Clarke: 590 (1894b); C.B. Clarke: 194 (1897/98) p.p. non *C. owanii* Boeck.: 29 (1876).

M. riparius sensu Gordon-Gray: 106 (1972) non Schrad. (1821).

Icones: Vorster: figs 6, 8, 9 (1978a).

Vouchers: *B.J. Huntley 702; K.D. Huntley 471; Moll 4758; C.J. Ward 525, 564, 565, 591, 1960.*

Description: Vorster: 125 (1978a).

Distribution: Coast, Midlands, Maputaland.

Robust perennials up to 1.5 m high. Leaves numerous, up to 14.5 mm wide, rigid, scabrid on margins and abaxial surface of midrib, faintly bluish green in colour. Inflorescence a robust compound (occasionally simple) anthela bearing closely packed brown spikelets. Grow in open grassland, in direct sunlight, usually along water courses but seldom in water, often forming local stands. Massive, branched, horizontal rhizome is developed (not unlike that of cultivated *Iris*, but clothed in scale leaves that become black and fibrous before wearing away). Inland, plants occur mostly in riverine situations and at higher altitudes (above 1 520 m, Mpendhle area) are found in narrow valleys drained by small streamlets.

Vorster (1986b) established a new species, *M. drakensbergensis*, to accommodate plants known from only two sites in the Natal Drakensberg, Cathedral Peak and Loteni, about 1 800 m alt., (Uplands). These differ from *M. solidus* only in their smaller size, vertical rhizome, purple pigmentation of leaf sheaths and absence of peripheral air canals in main culm. Such differences may be associated with growth at high altitudes and in heavier soils (rhizome structure)? It is questionable whether the only known gatherings *(Killick 117; Hilliard & B.L. Burtt 16145)* are worthy of specific differentiation or whether they merely represent the upland phase of *M. solidus*. In this treatment they are included within *M. solidus*, pending further study of the species in Natal, from Coast to Uplands.

There are other Natal plants very closely related to *M. solidus*. These have been segregated as *M. owanii* (No. 14/17) and *M. grantii* (No. 9/17) (Vorster 1978a). The criteria applied are neither entirely convincing, nor easily used. The main character on which Vorster (*l.c.*) based segregation of the two latter taxa from the first, was the growth pattern of the rhizome (vertical in *M. owanii* and *M. grantii*; horizontal in *M. solidus*). Not only is this criterion often impossible to apply, since rhizomes are difficult to dig out and consequently seldom represented in herbaria, but when available, are not always entirely convincing. (Is the variation perhaps dependent upon soil textures and other edaphic conditions, as well as seasonal variations ?). The differences separating *M. owanii* from *M. grantii* are also not adequately divisive. It is acknowledged that *M. owanii* and *M. grantii* occupy habitats different from the grassland glades favoured by *M. solidus*. They are plants of shaded situations; along streamlets, or in disturbed, more open glades of Coast and Midland forest, or as aggressive weeds (*M. grantii* only ?) where moisture and some shade are available. It is also accepted that they have a facies slightly different from that representative of *M. solidus* (clear green leaves, as well as other small differences). Despite these differences, identification is not always possible, except arbitrarily. *M. owanii* and *M. grantii* are here included in what is regarded as a plexus or macrospecies under the name *M. solidus*. A recent aberrant collection from the coast (*C.J. Ward 10980*) has added to the belief that hybridisation and its consequences have played a part in establishing some of the complexities of the macrospecies and that not only further fieldwork, but also karyological investigation and study of reproductive methods are needed if more complete understanding of the complex is to be achieved. Those who wish for further detail are referred to the work of Vorster (1978a), where literature citations for *M. owanii* and *M. grantii* are given.

The following are localities and specimen citations for these species (after Vorster 1978a):

M. owanii

Distribution: Coast (hinterland), Midlands, Zululand.

Vouchers: *Killick 691; Moll 2310, 2874; C.J. Ward 483.*

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* See Hybrid catalogue.

M. grantii

Distribution: Coast, Midlands, Zululand.

Vouchers: *Moll 1613; Most 82; C.J. Ward 7508; Venter 1492, 1555* (both NH).

In 1972, I misapplied the name *M. riparius* Schrad. to the macrospecies (Gordon-Gray 1972). This was misleading as the name is a synonym of the earlier *Cyperus thunbergii* Vahl, the type of which is a Cape plant with inflorescence spikes twice as long as wide (not known for Natal plants of the complex). It was not intended to include the Cape plants. They are definitely excluded from the macrospecies here discussed.

18. **Mariscus squarrosus** *(L.) C.B. Clarke* in The Flora of British India 6: 623 (1893/94); Kern: 631 (1974); Vorster: 257 (1977); P.L. Forbes: 55 (1987b). Type: *Anon s.n.* LINN 70.8 (LINN, holo.). Figure 56A, C.

Cyperus squarrosus L.: 6 (1756) p.p. Doubt exists as to where the name was first published, see Vorster: 336 (1978a); R.W. Haines & Lye: 253 (1983).

Scirpus intricatus L.: 182 (1771). Type: Habitat in India orientali et Cap. b. spei. [Note: Vorster (1978a) states no specimen was cited, but a specimen in E, probably collected by Koenig in the Orient, may be part of the type material.]

C. aristatus Rottb.: 23 (1773); C.B. Clarke: 179 (1897/98); Kük.: 502 (1936); Podlech: 35 (1967) excl. var. *atriceps* (Kük.) Podlech. Type: India, Dominio Konigio debemus (BM).

Icones: R.W. Haines & Lye: figs 510, 511 (1983); Vanden Berghen: fig. 223 (1988).

Vouchers: *T.H. Arnold 865* (PRE); *K.D. Gordon-Gray s.n.*; *Vorster 2700* (PRE).

Description: Vorster: 337 (1978a).

Distribution: Midlands, Uplands, Maputaland.

Widely distributed in tropical and subtropical regions. In the Americas it is known from southern Canada, southwards to Argentina and Chile. There are other synonyms not recorded here. Koyama (1985) states that the species is intermediate between *Cyperus* and *Mariscus*.

Vorster (1977) recorded it as new for Natal. It was not included in the earlier checklist (Gordon-Gray 1972).

Dwarf annual herbs forming small tufts in low vegetation bordering pans, or in moss mats covering shallow soil overlying rock outcrops. Basal leaf sheaths usually purple. Most easily recognised by open anthelate inflorescence of (2–)3–4(–7) spikes (usually 1–3 sessile, the others pedunculate) bearing closely packed, yellowish green to reddish brown markedly flattened spikelets; glumes each with a long, recurved apiculum.

19. **Mariscus sublimis** *C.B. Clarke* [see *M. sumatrensis* (No. 20)]

20. **Mariscus sumatrensis** *(Retz.) J. Raynal* in Adansonia, Sér. 2, 15: 110 (1975); Vorster: 166 (1978a); T. Koyama: 232 (1985). Type: Sumatra, *Wennerberg s.n.* (LD, holo.). Figure 55C, F.

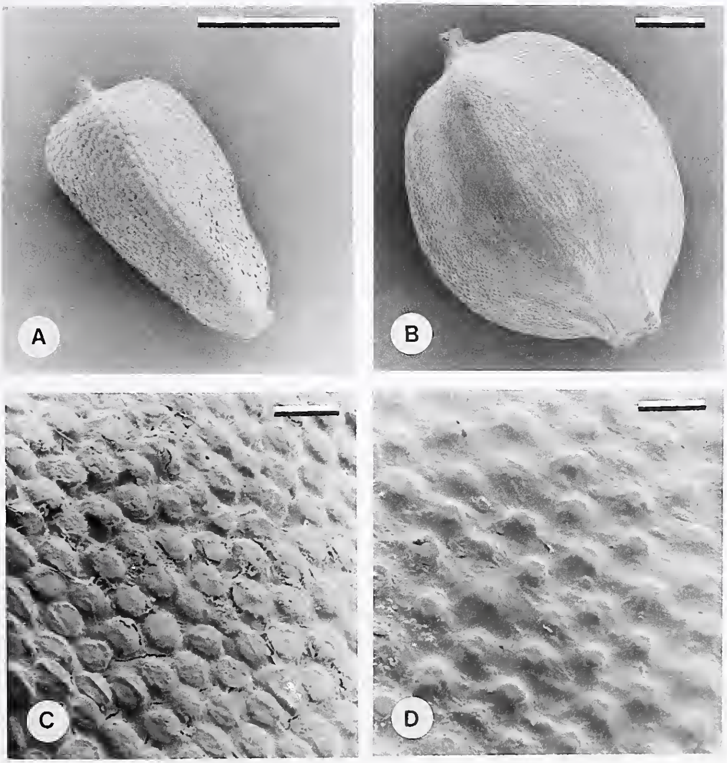

FIGURE 56.—*Mariscus*. A, C, *M. squarrosus, K.D. Gordon-Gray s.n.*; B, D, *M. vestitus, Ward 546*. Scale bars: A, B, 250 µm; C, D, 25 µm.

Kyllinga sumatrensis Retz.: 13 (1786/87). *K. umbellata* Rottb. var. *sumatrensis* (Retz.) Willd.: 258 (1797).

Scirpus cyperoides L.: 181 (1771). *M. cyperoides* (L.) Urban: 164 (1900) non A. Dietr. (1832/33). *Cyperus cyperoides* (L.) Kuntze: 333 (1898); Kük.: 514 (1936); Kern: 642 (1974); R.W. Haines & Lye: 204 (1983). Type: Habitat in India orientali, *Koenig s.n.* (LINN 71.421, NU microfiche).

M. sieberianus (*sieberanus*) Nees: 286 (1834b) nom. nud. ex C.B. Clarke: 622 (1893/94); C.B. Clarke: 593 (1894b); C.B. Clarke: 189 (1897/98); C.B. Clarke: 388 (1901/02); C.B. Clarke: 221 (1903); Schönland: 30 (1922); Podlech: 38 (1967). Type: Mauritius, *Sieber 3* (BRUX, E, G, K, MO).

M. nossibeensis Steud.: 63 (1855); C.B. Clarke: 590 (1894b); C.B. Clarke: 189 (1897/98); C.B. Clarke: 391 (1901/02). Type: Madagascar: Ins. Nossibe, *Boivin s.n.* (G).

Icones: C.B. Clarke: t. 23, figs 5, 6 (1909); Schönland t. 22 (1922); Vorster: figs 6, 35, 36 (1978a); R.W. Haines & Lye: figs 408, 409 (1983) as *Cyperus cyperoides* subsp. *cyperoides* var. *cyperoides*.

Vouchers: *T.H. Arnold 428* (PRE), *808; J. Browning 326; Comins 520; K.D. Huntley 230; Moll 1405, 2478, 4476; Trauseld 790; C.J. Ward 566.*

Description: Vorster: 168 (1978a); R.W. Haines & Lye: 204 (1983) as *Cyperus cyperoides* subsp. *cyperoides* var. *cyperoides*.

Distribution: widespread.

Note: there are many other synonyms that relate to the species in other parts of its distributional area. It is recorded from tropical Africa, tropical and subtropical Asia, Malesia, Sri Lanka, northern Australia; introduced to the West Indies and perhaps southern Africa (?). Koyama (1985) points out that because of Dietrich's homonym (see No. 5), the earliest validly published name of this taxon, *Scirpus cyperoides*, cannot be transferred to *Mariscus*.

The medium-sized, relatively sparsely tufted, leafy plants of *M. sumatrensis* are not known as regular components of natural vegetation, but are frequent in disturbed situations along roads and paths; in fallow fields and poorly maintained grassveld, or as weeds of cultivation. Young plants are relatively short with a clear yellowish green anthelate inflorescence of several spikes, each carrying fairly closely packed narrow spikelets. With maturity, the nodeless culms increase in height, the spikes elongate with some separation and swelling of the spikelets. There is also a change in glume colour to deeper brownish yellowish green.

Many authorities adopt a wide view of *M. sumatrensis*, including within its limits *M. macer* (No. 12), *M. macrocarpus* (No. 13), *M. sublimis* (No. 19) and other taxa not represented in Natal. Apart from its weediness, *M. sumatrensis* is different in facies and texture from *M. macer* and *M. macrocarpus* (the differences difficult to describe) and must be maintained. *M. sublimis* is a problem. Vorster (1978a: 178, table 6.4) distinguished *M. sublimis* from *M. sumatrensis* on a number of criteria which seem adequately divisive. After examining all available specimens of both taxa and carrying out field work, he cited only *Bews 16* (GRA, NU) for *M. sublimis* in Natal. This gathering (from the Coast, Amanzimtoti) dates back 70–80 years. If the species is indeed in Natal and sufficiently morphologically distinctive to be segregated at specific level, why are there no recent collections? It seems prudent not to record it here.

21. **Mariscus uitenhagensis** *Steud.*, Synopsis plantarum glumacearum 2, Cyperaceae: 317 (1855); Boeck.: 66 (1859); Vorster: 253 (1978a); P.L. Forbes: 55 (1987b). Type: Cape Province, Uitenhagen (Uitenhage), Pr. b. sp., ex Hrbo. Sprengel nunc Boeck. (probably *Zeyher 91* B, holo.) see Vorster (1978a).

M. marlothii sensu C.B. Clarke: 590 (1894b); C.B. Clarke: 187 (1897/98) non *Cyperus marlothii* Boeck. (1890a).

M. marlothii sensu C.B. Clarke var. *globospica* C.B. Clarke: 187 (1897/98); *Cyperus capensis* (Steud.) Endl. var. *pseudo-marlothii* Kük. forma *globospica* (C.B. Clarke) Kük.: 540 (1936). Type: Cape, Uniondale Div., rocky hill near Groot River, *Burchell 5020* (PRE).

M. capensis sensu Schönland: 29 (1922) p.p., non (Steud.) Schrad. (1832b).

C. capensis (Steud.) Endl. var. *pseudo-marlothii* Kük.: 540 (1936). Syntypes: Transvaal, Pretoria, Hugel ober Aapies-Rivier, *Rehmann 4035/4324* (B, Z); Johannesburg, *Mogg 578* (PRE); *Moss 5924* (J); Witbank, *Rogers 2569* (GRA, J, Z). Natal, Pietermaritzburg, *Wilms 2359*. Mozambique, Ressano Garçia, *Schlechter 11950* (B,Z).

Icones: Vorster: figs 6, 110, 111 (1978a).

Vouchers: *Getliffe 167; K.D. Huntley 578; C.J. Ward 1831, 8737.*

Description: Vorster: 253 (1978a).

Distribution: Coast (hinterland) Midlands, N Natal, Zululand.

Sparsely tufted, leaf-bearing perennials with shoot bases swollen into pseudobulbs enveloped in membranous, brown leaf sheaths. Grow in mixed grassland, often where there has been some disturbance, or on rock ledges usually in sandy soil. Most easily recognised by open anthelate inflorescence of 4–6 rays each carrying terminally, a cylindrical spike of densely crowded, short, green, 1-flowered spikelets. Occasionally rays reduced in length to form a pseudo-head. When this occurs relationship with *M. capensis* is emphasized (spikelets practically identical in the two species). There is also close relationship with *M. chersinus* (No. 3) a larger species with a more tropical distribution (recorded in Natal only from Maputaland). Achenes are said to be differently shaped (Vorster 1978a) but fruit shape is not reliable unless large samples of fully mature specimens have been compared.

22. **Mariscus vestitus** *(Hochst.) C.B. Clarke* in Conspectus florae africae, 5: 595 (1894b); C.B. Clarke: 188 (1897/98) p.p.; C.B. Clarke: 385 (1901/02) p.max.p.; Vorster: 220 (1978a). Type: Natal, In solo arenoso ad sylvarum margines circa Natalbai, *Krauss 287* (G, M, MO). Figure 56B, D.

Cyperus vestitus Hochst.: 755 (1845); K. Schum.: 118 (1895); Kük.: 542 (1936); R.W. Haines & Lye: 212 (1983).

Icones: Vorster: figs 6, 80, 81 (1978a); R.W. Haines & Lye: figs 425, 426 (1983) as *Cyperus vestitus*.

Vouchers: *Vorster 2631, 2636, 2706* (all PRE); *C.J. Ward 541, 542, 546, 547, 583, 615, 757, 759* (an excellent series).

Description: Vorster: 220 (1978a).

Distribution: Coast, Maputaland.

The close relationship of *M. vestitus* to *M. pseudovestitus* (No. 16) has already been considered under the latter. The most reliable difference by which these taxa are distinguished is the glume apex (mucronate in *M. vestitus*; midvein not excurrent in *M. pseudovestitus*). Both taxa exhibit some variability, so that to differentiate between them (apart from the distinctive glume apex) is not simple.

M. vestitus has a disjunct distribution in Natal (Maputaland, Mbazwane area ± 27°30′S, then not present again until Isipingo ± 30°S). It must be regarded as rare. Plants usually grow in sand in exposed, almost bare situations. Known from tropical Africa (Kenya and northern Tanzania) where it occupies grassland habitats or rocky outcrops in savanna or woodland (Haines & Lye 1983).

0468005 OXYCARYUM

Oxycaryum *Nees* in Flora brasiliensis 2,1: 90 (1842); Palla: 168 (1908); Lye: 280 (1971b); R.W. Haines & Lye: 144 (1983); Vanden Berghen: 281 (1988). Type species: (*O. schomburgkianum* Nees) = *O. cubense* (Poepp. & Kunth) Lye.

Crepidocarpus Klotzsch ex Boeck.: 414 (1869/70).

Scirpus L. Section *Oxycaryum* (Nees) Beetle: 263 (1944); Beetle: 481 (1949); Beetle: 81 (1953).

Oxycaryum was segregated from *Scirpus* in the broad sense and raised to generic rank by Lye (1971b). At the same time, this author transferred *Oxycaryum* from the tribe Scirpeae to Cypereae, noting its spirally arranged glumes and *Cyperus*-type embryo. Later Haines & Lye (1983) pointed out that its culm anatomy differed from patterns represented in most *Scirpus* species. Haines & Lye (1983) believe *Oxycaryum* to have its closest relatives in *Cyperus* subgenus *Anosporum* (Nees) C.B. Clarke. (*Anosporum* Nees as genus: 287, 1834b). To this subgenus belongs *Cyperus pectinatus* Vahl (= *C. nudicaulis* Poir.).

1. **Oxycaryum cubense** *(Poepp. & Kunth) Lye* in Botaniska Notiser 124: 281 (1971b); R.W. Haines & Lye: 144 (1983) as *O. cubensis*; Vanden Berghen: 282 (1988). Type: Cuba, *Poeppig s.n.* (W). Figures 57 & 58.

Scirpus cubensis Poepp. & Kunth in Kunth: 172 (1837); C.B. Clarke: 451 (1901/02). *Anosporum cubense* Boeck.: 26 (1869).

Isolepis echinocephala Oliv.: 167 (1875). Syntypes: Egyptian Sudan, by the Nile 2°N lat., and near Khartoum (*Cyperus* No. 3, Appendix Speke's Journ. 653), *Grant*.

Icones: Oliv.: t. 107 (1875); Lye: fig. 1: (1971b); R.W. Haines & Lye: fig. 282 (1983); Vanden Berghen: figs 225, 226 (1988).

Vouchers: *Tinley 1043; Pooley 218, 1471; C.J. Ward 8044, 8546.*

Description: R.W. Haines & Lye: 144 (1983) as *O. cubensis*.

Distribution: Maputaland.

Uncommon in Natal; known only from pans of Pongola drainage system on Maputaland plain, (including pans of Ndumu Game Reserve), where plants form parts of small drifting rafts of floating vegetation. Relatively small spikelets compacted into heads usually arranged in anthelate inflorescences surrounded by long leafy bracts, make identification straightforward. Elongate stolons and long adventitious roots are developed; these organs occasionally result in plants becoming attached to wet soil. The only other aquatic sedge in Natal is *Cyperus pectinatus* Vahl. This species is also confined to Maputaland where it is found in similar habitats, but more often anchored rather than free-floating. In both *Oxycaryum cubense* and *C. pectinatus* achenes have a 'corky' pericarp that facilitates flotation; the shape, with an elongate, beak-like apex formed from the persistent style is also similar.

0459010 PYCREUS

Pycreus *P. Beauv.*, Flore d'Oware et de Benin, en Afrique 2: 48 (1816); C.B. Clarke: 155 (1897/98); C.B. Clarke: 288 (1901/02); Schönland: 21 (1922); Podlech: 38 (1967); R.A. Dyer: 882 (1976); P.L. Forbes: 55 (1987b). Type species: *P. polystachyos* P. Beauv. (name illegit.?).

Cyperus L. subgen. *Pycreus* (P. Beauv.) A. Gray: 517 (1848); Kük.: 326 (1936); R.W. Haines & Lye: 268 (1983). [Note: both Kükenthal and R.W. Haines & Lye erroneously attribute the above combination to C.B. Clarke 33 (1884); see Tucker: 396 (1987)].

Note: in this genus, identification of species may prove difficult. Knowledge of plants in the field is advantageous as growth form, nature of underground organs and spikelet colour are aids in accurate naming. Some species (*P. betschuanus, P. chrysanthus* in particular) are inadequately known. *P. nitidus* differs somewhat from the tropical phase of the species and an African re-appraisal is needed. There is the possibility that, in vlei areas where species are sympatric, intermediates develop and maintain themselves, if not sexually (?), then by vegetative propagation.

1. **Pycreus atribulbus** *(Kük.) Napper* in Journal of the East African Natural History Society 28: 5 (1971a); Cl. Reid: 45 (1986). Syntypes: 'Südafrika: Regio orientalis et mosambicensis', *Schlechter 12254*. 'Deutsch-Ostafrica, ohne Ortsangabe', *Busse 749*. Figure 59A, D.

Cyperus atribulbus Kük.: 363 (1936); R.W. Haines & Lye: 279 (1983).

Icones: R.W. Haines & Lye: fig. 570 (1983).

Vouchers: *J. Browning 172; C.J. Ward 725, 2918, 7731.*

Description: R.W. Haines & Lye: 279 (1983).

Distribution: Maputaland.

Tufted, perennial plants of *P. atribulbus* have a facies suggestive of many species of *Cyperus*, but always only two style branches to florets. Glumes shiny brownish green; spikelets narrow (± 1 mm wide). Shoot bases hard, usually slightly swollen, clothed in fibrous remains of old leaf bases. Habitat usually organically rich sand along margins of pans containing permanent water, in open low-growing vegetation comprising hygrophilous herbs.

Relationship is closest to *P. intactus* (No. 6), but this species has wider spikelets that tend to a more reddish brown coloration, and more compactly tufted plant bases. There is evidence of intergradation.

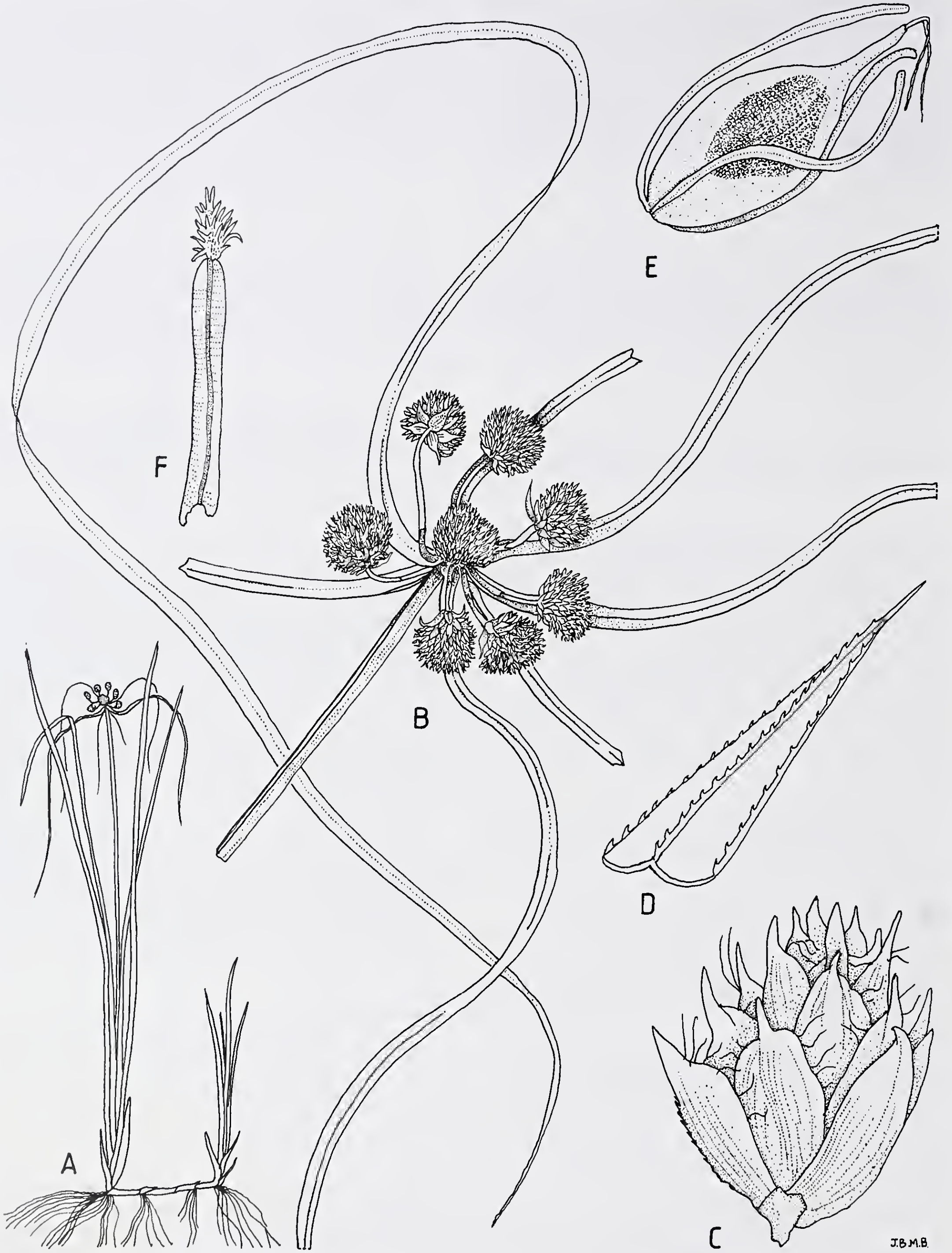

FIGURE 57.—*Oxycaryum cubense.* A, plant, × 1/10; B, inflorescence, × 1; C, spikelet, × 10; D, abaxial surface of leaf apex, × 3; E, achene with two style branches and 3 filaments attached, × 20; F, anther and crest, × 34. A, B, *Ward 8044*; C–F, *Ward 8546*.

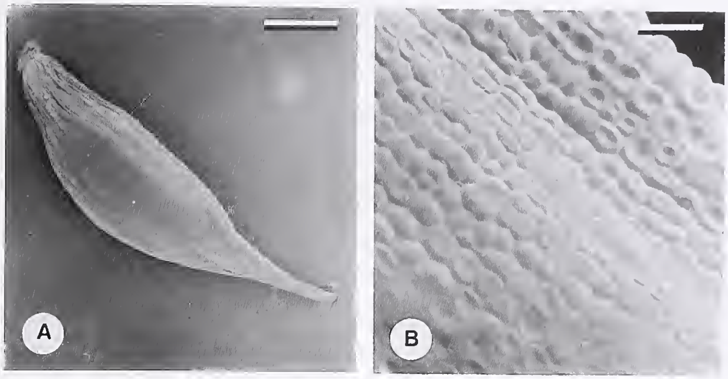

FIGURE 58.—*Oxycaryum cubense*, *Ward 8546*. Scale bars: A, 500 µm; B, 25 µm.

2. **Pycreus betschuanus** *(Boeck.) C.B. Clarke* in Conspectus florae africae 5: 535 (1894b); C.B. Clarke: 159 (1897/98); C.B. Clarke: 304 (1901/02); Podlech: 41 (1967). Type: Betschuanaland (Botswana): 'Bei der Quelle Kachun', *Marloth 1027* (B).

Cyperus betschuanus Boeck.: 406 (1890a); Kük.: 332 (1936).

C. globosus All. var. *nilagirica* C.B. Clarke: 49 (1884) p.p.

Icones: Cape Province: Hay Division, Griqualand West, between the Asbestos Mountains & Witte Water, Feb. 17, 1812, *Burchell 2081* (K, NU, cibachrome). Compared against type (B) by C.B. Clarke (Oct. 1893) and seen by Kük. (1913).

Description: C.B. Clarke: 159 (1897/98).

Note: it is not known whether this species does occur in Natal, but there are plants from vleis in the Midlands and Uplands that carry wiry, creeping rhizomes and blackish brown, narrow spikelets that relate to it closely in superficial facies.

P. betschuanus bears general relationship to the Natal species *P. cooperi* (No. 4) and *P. oakfortensis* (No. 12), which, themselves, have been greatly confused. *P. cooperi* is tufted, never stoloniferous; *P. oakfortensis* bears strong, thickish, obliquely descending stolons; *P. betschuanus* has thinner, more wiry stolons that appear to grow horizontally rather than obliquely downwards. All bear almost black spikelets with glumes that differ in minutae (the differences often difficult to express). There are also differences in inflorescence form (degree of contraction from branching anthelas into heads) and in spikelet width, but with the ranges of variation for each species inadequately established it is unwise to segregate on these criteria. A thorough study is needed to establish whether the occasional finely stoloniferous examples from Natal vleis fall within limits of the Botswanan *P. betschuanus*. In Natal, most vleis are the natural habitats of several sympatric species. Therefore the taxonomist should take into account the possibility of survival of hybrids originating from interspecific crossing and subsequent backcrossing. Natal examples referred to *P. betschuanus* may owe their existence to such an origin.

Key to species

1a Glumes with a conspicuous membranous, often white or translucent margin, 0.2–0.3 mm wide. Spikelets 7–20 × 1.0–2.5 mm. Plants annual, but sometimes producing stolons, and then short-lived perennials; robust, generally with one main culm or thinly tufted .... 8. *P. macrostachyos*
1b Glumes lacking a conspicuous membranous margin. Spikelets variable in length, but usually never attaining 20 mm. Plants annual or perennial, robust or small 2

2a Plants dwarf annuals with a poorly developed rooting system (no underground organs of perennation). Culms not longer than 300 mm (150 mm usually maximum) 3
2b Plants perennial, with, or without, evident underground organs of perennation; if annual, then with erect culms approximately 300 mm or more in length or, if shorter, then usually robustly tufted 6

3a Glumes very dark (almost black) with a narrow greenish yellow keel .... 10. *P. niger*
3b Glumes greenish or fawn or dark reddish brown, never almost black with a narrow greenish yellow keel 4

4a Achene surface transversely undulate, undulations formed by the adjacent ends of longitudinally rectangular epidermal pericarp cells. Stamens 3 per floret .... 5. *P. flavescens*
4b Achene surface appearing smooth, reticulated, or with longitudinal rows of projecting papillae. Stamens 2 per floret 5

5a Glumes 1.7–2.0 mm long, acute to slightly mucronate. Achenes obovate to obcordate in outline, margins near base asymmetric, markedly flattened in the plane of the spikelet .... 13. *P. pelophilus*
5b Glumes 1.0–1.2 mm long, conspicuously mucronate. Achenes obovate to elliptic, not markedly flattened in the plane of the spikelet, margins near base symmetric .... 15. *P. pumilis*

6a Plants perennial; often of copious growth consisting of underground stolons covered in persistent sheaths and rooting at nodes; these, above ground, become trailing, densely leafy stems that terminate each in a nodeless culm carrying an anthelate inflorescence 7
6b Plants erect, slenderly to robustly tufted, either annual without short underground rhizomes or elongate stolons, or perennial with these organs or remnants of them. (Note: short underground rhizomes may be soft and of limited duration; narrow, delicate lateral stolons are easily broken, the fragments overlooked among adventitious roots. It is essential to search carefully for the presence of both types in field and herbarium) 8

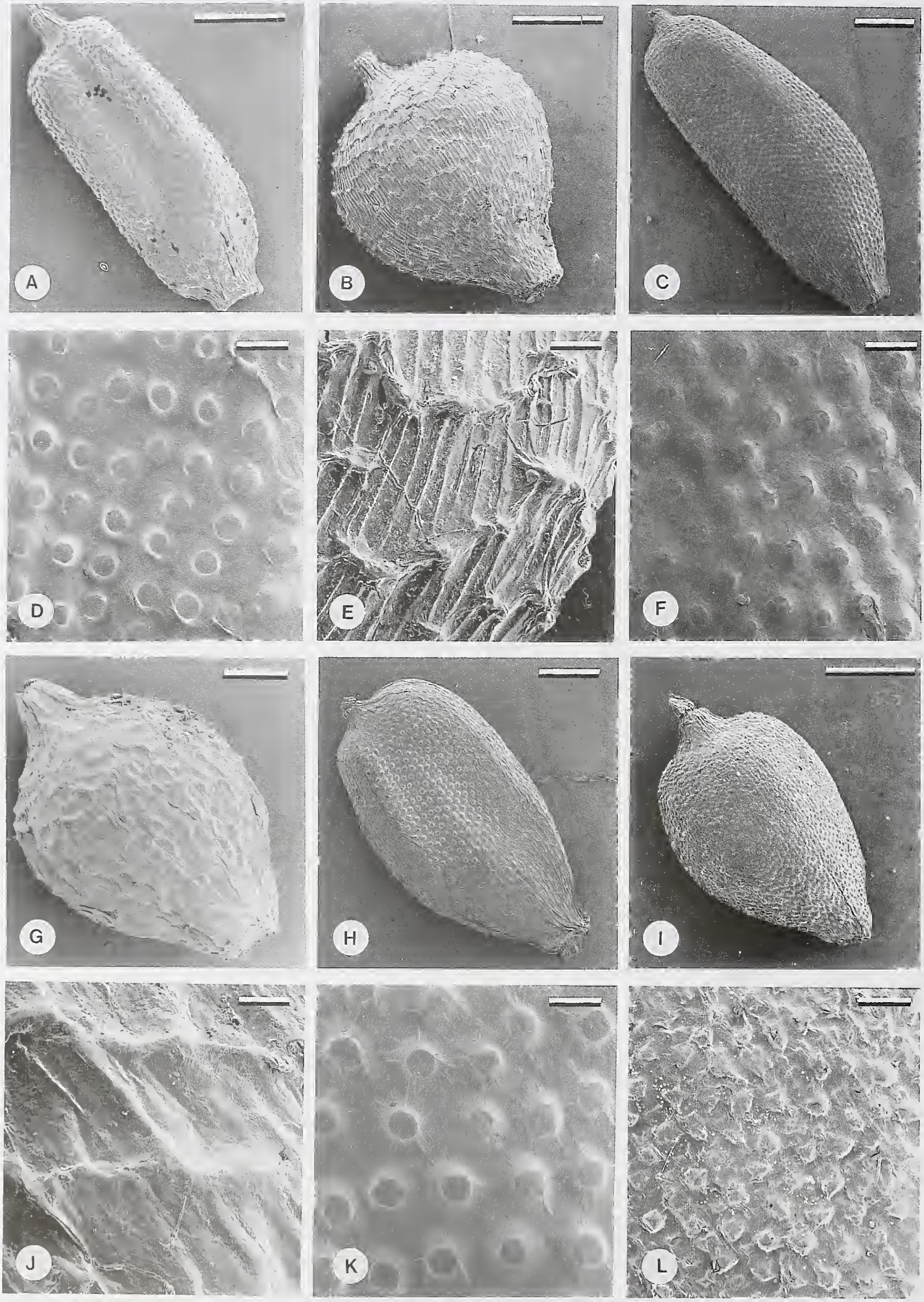

FIGURE 59.—*Pycreus*. A, D, *P. atribulbus*, *J. Browning 172*; B, E, *P. flavescens*, *J. Browning 181*; C, F, *P. intactus*, *Ward 5399*; G, J, *P. macranthus*, *J. Browning 148*; H, K, *P. macrostachyos*, *Tinley 603*; I, L, *P. mundii*, *Ram s.n.* Scale bars: A–C, G–I, 250 µm; D–F, J–L, 25 µm.

7a Spikelets 2–3 mm wide. Glume with each flank marked by a small, shallow, obliquely longitudinal depression pallid and membranous against the dark rather dull brown of the remainder (not always well marked nor easy to distinguish in Natal specimens: look at several glumes, about central on spikelet). Leaves often with a bluish tint in life. Plants generally less robust in all their parts than for *P. nitidus*, except that stolons (1–4 mm thick) and aerial stems may be longer ...... 9 *P. mundii*
7b Spikelets 3–4 mm wide. Glumes dark, shining chestnut-brown with lighter greenish markings on keel; flanks unmarked by any depression. Leaves bright green in life, often clustered immediately behind terminal nodeless culm that carries inflorescence. Plants with robust stolons (3–8 mm thick) that are clearly nodose, but often not as elongate as in the contrast .... 11. *P. nitidus*

8a Glumes almost black or blackish purplish brown with, or without, lighter markings at keels and margins 9
8b Glumes variously coloured, but never approaching black (very dark reddish brown sometimes in *P. flavescens* (No. 5), then glumes very neatly imbricated and plants obviously annual) 13

9a Plants slender with few, or often only one culm to the shoot. Each shoot base developed underground into a curved descending stolon, accompanied, or not, by additional, more or less lateral stolons, OR plants appearing annual, the shoots without descending stoloniferous bases, but linked by slender lateral stolons that are easily broken and overlooked among adventitious roots 10
9b Plants robustly tufted with dark brown, fairly wide persistent leaf sheaths. *No development whatever of stolons*, rhizome merely serving to link shoots. Culms flexuous, often drooping slightly with weight of the inflorescence .... 4. *P. cooperi*

10a Plants appearing annual except that there may be thin lateral stolons linking the slender aerial shoots (look carefully) 11
10b Plants perennial, generally more robust than the contrast with a descending stoloniferous base to each shoot, accompanied, or not, by additional lateral stolons 12

11a Spikelets 6–10-flowered (few for the genus). Glumes very dark (almost black) with a narrow greenish yellow keel giving a 'gold-laced' effect. Inflorescence anthelate or head-like, lacking solitary peduncled spikelets .... 10. *P. niger*
11b Spikelets about 20-flowered. Glumes very dark purplish brown to black, the keel yellowish to pallid, not as obvious as in the contrast. Inflorescence anthelate or head-like, often with one or more branches carrying 1–2 spikelets only ... 2. *P. betschuanus*

12a Achenes transversely undulate. Spikelets 3–5 mm wide; usually 2–10 in a head (sometimes 1 or more short branches added, each carrying few spikelets) .... 7. *P. macranthus*
12b Achenes smooth or reticulate or papillose. Spikelets 1–3 mm wide, usually more than 20 in a congested head (sometimes short branches developed, each carrying congested spikelet groups) .... 12. *P. oakfortensis*

13a Achene surface transversely undulate, undulations formed by adjacent ends of longitudinally rectangular, epidermal pericarp cells. Spikelets pale fawn, or brown, or dark red. Plants annual without underground perennating organs ... 5. *P. flavescens*
13b Achene surface smooth, reticulated, or papillose. Spikelet colour and plants variable 14

14a Spikelets linear, fawn or pallid, sometimes greenish in life, crowded into a compact, brush-like head (very seldom slightly more open with branches visible without dissection). Plants tufted .... 14. *P. polystachyos*
14b Spikelets variable in shape and colour, inflorescence always a branched anthela (if contracted to a head, then spikelets 3.0–4.5 mm wide) 15

15a Spikelets 1.0–1.5 mm wide, linear; dull brown with yellowish glume keels. Plants tufted; shoots with a hard, sometimes slightly swollen base. No development of stolons or visible rhizome (Maputaland only) .... 1. *P. atribulbus*
15b Spikelets usually 2.0 mm or wider, lanceolate to ovate or elliptic, if linear, then bright golden reddish brown or greenish red. Plants tufted, but shoots not hardened basally, with, or without, some evidence of stolons or visible rhizome 16

16a Spikelets lanceolate (widened slightly above the base), greenish red with faint yellowish markings in life, becoming dark brown when dry. Glumes rather laxly imbricated. Plants tufted, lacking any evidence of underground perennating organs .... 6. *P. intactus*
16b Spikelets linear, ovate or elliptic. Glumes closely and regularly imbricated. Plants usually with evidence of a soft impermanent rhizome, or a descending stoloniferous shoot base 17

17a Spikelets linear, golden yellow to cherry-red or chestnut .... 3. *P. chrysanthus*
17b Spikelets lanceolate to ovate or elliptic, putty-brown or fawn .... 16. *P. unioloides*

3. **Pycreus chrysanthus** *(Boeck.) C.B. Clarke* in Conspectus florae africae 5: 535 (1894b); C.B. Clarke: 161 (1897/98); Podlech: 41 (1967). Type: Pondoland, Umtsikaba River, below 500 ft, *Drège 4409* (K, holo.; NU, cibachrome).

Cyperus chrysanthus Boeck.: 476 (1867/68); C.B. Clarke: 67 (1884).

Icones: *Drège 4409* cibachrome NU. (2 culms bearing inflorescences; basal organs not well represented; fragments of a stolon attached.)

Voucher: *Grant s.n.* (K).

Description: C.B. Clarke: 161 (1897/98).

Grant's specimen carries no locality other than 'Natal'. Since the type is from Pondoland, below 500 ft., it may perhaps be suggested that the species may be looked for in southern coastal Natal. I have not seen Grant's specimen, nor other Natal plants that might be referred to this species with confidence. Drège's type suggests possible relationship with *P. nitidus* (No. 11), but the growth form does not seem right, and with *P. unioloides* (No. 16), which has wider spikelets.

4. **Pycreus cooperi** *C.B. Clarke* in Conspectus florae africae 5: 535 (1894b) name only; C.B. Clarke: 160 (1897/98) description. Syntypes: Orange Free State, *Cooper 912* (K, NU cibachrome); Transvaal, Houtbos, *Rehmann 5652* (K, NU cibachrome).

Cyperus cooperi (C.B. Clarke) Kük.: 68 (1934); Kük.: 331 (1936).

Icones: *Cooper 912* (plant complete); *Rehmann 5652* (shoot base present, but whole plant inadequately represented; cibachromes NU).

Vouchers: *K.D. Gordon-Gray 5009, 50035.*

Description: C.B. Clarke: 160 (1897/98).

Distribution: Midlands, Uplands.

Plants characterised by their tufted growth form, shoots enclosed by persistent dark brown to black sheaths that do not fragment into fibres. Culms relatively fine and flexible carrying on short (sometimes hardly visible) branches, dense, head-like clusters of blackish spikelets. Glume colour is lightened by the yellowish keels that form pale narrow streaks. Main bract much overtops inflorescence. In the field, particularly following rain, plants form conspicuous 'spiky' clumps in vleis and shallow streamlets amongst grasses and other sedges. They are made conspicuous by their slender leaves and culms, the latter drooping by the weight of wet inflorescences, and 'spiky' by the projecting overtopping bracts.

The species has been much confused with *P. oakfortensis* (No.12) by both collectors and in herbaria. It was not listed in Natal in Ross (1972), but included, quite incorrectly, under *P. oakfortensis* which is often sympatric.

5. **Pycreus flavescens** *(L.) Rchb.*, Flora germanica excursoria 1: 72 (1830); Nees: 283 (1834b); C.B. Clarke: 537 (1894b); C.B. Clarke: 156 (1897/98); C.B. Clarke: 290 (1901/02); Schönland: 21 (1922); Podlech: 41 (1967); P.L. Forbes: 56 (1987b); Hilliard: 54 (1987). Type: from Europe. Figure 59B, E.

Cyperus flavescens L.: 46 (1753); Kunth: 5 (1837); Steud.: 4 (1855); Boeck.: 438 (1867/68); C.B. Clarke: 36 (1884); Ridl.: 125 (1884); Kük.: 398 (1936). *Chlorocyperus flavescens* (L.) Rikli: 563 (1895).

P. rehmannianus C.B. Clarke: 542 (1894b) name only; C.B. Clarke: 156 (1897/98) p.p.; Hilliard: 54 (1987). *Cyperus rehmannianus* (C.B. Clarke) Boeck. ex Kuntze: 334 (1898). *C. flavescens* L. var. *rehmannianus* (Boeck.) Kük.: 1 (1921). Syntypes: Transvaal, Houtbos, *Rehmann 5651*; Natal, Howick, *Schlechter 6789*.

P. flavescens (L.) Rchb. var. *castaneus* Lye: 621 (1981b); *C. flavescens* var. *castaneus* (Lye) Lye in R.W. Haines & Lye: 282 (1983), ibid. Appendix 3: 2 (1983d). Type: Kenya, Muranga Dist.: *Lye et al. 6369* (EA).

Icones: Lam: t. 38, fig. 1 (1791); C.B. Clarke: t. 4, figs 40, 41 (1884); Schönland: t. 4 (1922) (achene sculpturing unclear); Kük.: fig. 45K–O (1936) as *Cyperus rehmannianus*; R.W. Haines & Lye: figs 576, 577 (1983) as *C. flavescens*; Vanden Berghen: fig. 228 (1988).

Vouchers: *J. Browning 181; K.D. Huntley 399; C.J. Ward 2547* (typical)

Description: C.B. Clarke: 156 (1897/98) (*P. flavescens* and *P. rehmannianus*).

Distribution: widespread.

Common in Natal. May be regarded as a weed, for the slender annual plants with their neat spikelets in an anthelate inflorescence (branching occasionally reduced) are almost ubiquitous in seeps, roadside ditches, alluvium along watercourses, in shallow soil over rock outcrops, in fact in any disturbed area where water is available. As with most annual, weedy sedges there is variation in robustness from diminutive, depauperate examples 50 mm or less in height to plants up to 0.25 m. Spikelet coloration also varies from pale yellowish brown to deep dark red, the darker colours better represented at higher altitudes.

Some authorities [Reid (1985) and Hilliard (1987)], maintain *P. rehmannianus* as a species distinct from *P. flavescens*. Others, (Lye in Haines & Lye 1983) give it only varietal status as a synonym of *Cyperus flavescens* L. [var. *castaneus* (Lye) Lye].

The faintly transversely undulate surface of the achene sets this species apart from other annual representatives of the genus in Natal [*P. macranthus* (No. 7) has similarly marked fruits, but is rhizomatous and perennial; also the spikelets are very much wider]. Outer cells that give the waviness eventually wear away and older achenes appear smooth.

With the continuous range in plant form that constitutes *P. flavescens* in Natal, there seems no advantage in attempting establishment of infraspecific categories; their limits would be too vague.

6. **Pycreus intactus** *(Vahl) J. Raynal* in Adansonia, Sér. 2, 17: 43 (1977a). Type: Coll. ? 'herb. de Galam no 17' in Jussieu 1857 partim. (P-JU.). Figure 59C, F.

Cyperus intactus Vahl: 332 (1805); Kunth: 14 (1837); Steud.: 9 (1855).

C. ferrugineus Poir.: 261 (1806) name illegit. non Forssk.: 14 (1775); Kunth: 11 (1837); Steud.: 8 (1855); Kük.: 373 (1936). *P. ferrugineus* (Poir.) C.B. Clarke: 536 (1894b); C.B. Clarke: 158 (1897/98); C.B. Clarke: 298 (1901/02). *C. polystachyos* Rottb. var. *ferrugineus* Boeck.: 479 (1867/68).

C. micans Kunth: 12 (1837). *C. polystachyos* Rottb. var. *micans* C.B. Clarke: 54 (1884).

Icones: Vanden Berghen: fig. 229 (1988).

Vouchers: *Krauss 189; P.B. Taylor 31; C.J. Ward 735, 5399, 6837; M.C. Ward 1917.*

Description: C.B. Clarke: 158 (1897/98) as *P. ferrugineus.*

Distribution: Coast, Midlands.

Tufted, leafy perennials (or annuals depending upon habitat conditions) with erect culms, branched anthelate inflorescences; spikelets lanceolate (not linear at base) and glumes rather laxly placed (to give a lacy effect), often a greenish red in colour when young. The general facies is of species of *Cyperus* rather than *Pycreus*, but style branches are always two.

Repeatedly, the species has been related to *Pycreus polystachyos* (No. 14), but in Natal at least, *P. intactus* should be fairly easily segregated by the characters enumerated above. The spikelets of *P. polystachyos* are linear, far more congested in the inflorescence (but see var. *laxiflorus*, p. 147) and brown in colour. *P. intactus* also has a wider distribution in Natal. Plants behave as weeds, as well as being quite frequent in natural grassveld and scrubby vegetation that has undergone some disturbance. Habitats are often dry and it would seem the species has greater tolerance for water stress than has *P. polystachyos. P. intactus* is known, not only throughout Africa (although not mentioned by Haines & Lye 1983), but in both Old and New World (absent from Europe).

7. **Pycreus macranthus** *(Boeck.) C.B. Clarke* in Conspectus florae africae 5: 538 (1894b); C.B. Clarke: 156 (1897/98); C.B. Clarke: 293 (1901/02); Rendle: 107 (1899); Hilliard: 54 (1987). Type: South Africa, Cape Province, Komgha Division, near Komgha, *Drège 4394* (K). Figure 59G, J.

Cyperus macranthus Boeck.: 462 (1867/68); C.B. Clarke: 42 (1884) excl. syn.: Ridl.: 126 (1884); K. Schum.: 117 (1895); R.W. Haines & Lye: 280 (1983).

C. lanceus Thunb. var. *macrostachya* Kunth: 8 (1837).

Icones: R.W. Haines & Lye: figs 574, 575 (1983).

Vouchers: *J. Browning 148; K.D. Gordon-Gray 5008; P.B. Taylor 13, 48; C.J. Ward 2846.*

Description: C.B. Clarke: 156 (1897/98).

Distribution: widespread.

Fairly robust, sparsely tufted perennials present in many Natal vleis. Shoots interconnected by stolons, 2–3 mm in width, that are descending rather than transverse. How deeply these underground stems do penetrate the heavy ooze in which they grow is not easily determined. When achenes are young, plants recognised by stolons; contracted head-like inflorescences of up to 16, mostly sessile spikelets ± 8 mm wide and dark reddish black, 5-veined glumes, each with a well-marked greenish fawn keel terminating below apex. But mature achenes, surfaces marked by transversely undulate lines formed by limits of the large, vertically elongate pericarp cells, are the most conclusive means of identification. The outermost cells eventually rupture and wear away so that old achenes may appear smooth, or almost so. In the past this species has served as a repository for many specimens with an anthelate or head-like inflorescence of brown to blackish spikelets that do not belong within its limits (see *P. nitidus*, No. 11).

8. **Pycreus macrostachyos** *(Lam.) J. Raynal* in Hooper & J. Raynal in Kew Bulletin 23: 314 (1969). Type: from Africa, Herb. Lamarck (P–LA, holo.). Figure 59H, K.

Cyperus macrostachyos Lam.: 147 (1791). *C. macrostachyos* Lam. subsp. *macrostachyos* R.W. Haines & Lye: 288 (1983). *P. albomarginatus* Nees: 9 (1842); C.B. Clarke: 534 (1894b); C.B. Clarke: 305 (1901/02); Podlech: 41 (1967). *C. albomarginatus* Steud.: 10 (1855).

C. tremulus Poir.: 264 (1806); Kunth: 16 (1837); Boeck.: 469 (1867/68); C.B. Clarke: 282 (1883a); C.B. Clarke: 71 (1884). *P. tremulus* (Poir.) C.B. Clarke: 542 (1894b); C.B. Clarke: 306 (1901/02). *P. macrostachyos* (Lam.) J. Raynal subsp. *tremulus* (Poir.) Lye: 622 (1981b); *C. macrostachyos* Lam. subsp. *tremulus* (Poir.) Lye in R.W. Haines & Lye: 289 (1983). Type: Madagascar, *Du Petit Thouars s.n.* (P).

Icones: R.W. Haines & Lye: figs 596–598 (1983); Vanden Berghen: figs 232, 233 (1988).

Vouchers: *Tinley 603; C.J. Ward 4569, 5574.*

Description: R.W. Haines & Lye: 288 (1983) (subsp. *macrostachyos*); ibid.: 289 (subsp. *tremulus*).

Distribution: Zululand, Maputaland.

Robust annuals each with a solitary triangular culm up to 5 mm in thickness (occasionally a few stems form a narrow tuft). Anthelate inflorescence long-bracteated and spreading and carries many, long, loosely spaced golden or reddish brown spikelets. General facies is that of *Cyperus distans* L. f. but spikelets wider and distinctive because of very wide (0.2–0.3 mm) hyaline border that looks white in life against greenish midrib, but becomes pallid-fawn when dry. Glume keel terminates below this membranous margin; glume apices markedly obtuse.

Tropical species that reaches the limit of its southern distribution in Natal. Haines & Lye (1983) segregate two subspecies on grounds of shorter glumes (2.0–2.5 mm) and narrower spikelets (1–2 mm) in subsp. *tremulus*, as against glumes 2.2–3.0 mm long and spikelets 1.5–2.5 mm wide in the typical element. Distributional limits do not seem clearly different, so that recognition of subspecies does not, perhaps, accurately reflect the pattern of infraspecific variation. No attempt is made to place the few known Natal gatherings in subspecies. Plants recorded from margins of pans and wallows. Occasionally they may occur in seasonally wet, sparse grassland.

9. **Pycreus mundii** *(mundtii) Nees* in Linnaea 9: 283 (1834b) name only; Nees: 131 (1835) description; C.B. Clarke: 539 (1894b); C.B. Clarke: 157 (1897/98); C.B. Clarke: 294 (1901/02); Rendle: 106 (1899); Schönland: 21 (1922); P.L. Forbes: 57 (1987b). Type: South Africa, Cape Province, 'In districtu Zwellendam et George' *Mund s.n.* 'probabiliter in paludosis aut in fossis'. Figure 59I, L.

Cyperus mundii (Nees) Kunth: 17 (1837); Steud.: 9 (1855); Boeck.: 448 (1867/68); C.B. Clarke: 63 (1884); Ridl.: 125 (1884); K. Schum.: 117 (1895); Kük.: 2 (1921); Kük.: 183 (1926); Kük.: 380 (1936); R.W. Haines & Lye: 270 (1983). *Chlorocyperus mundii* (Nees) Rikli: 563 (1895).

Icones: Schönland: t. 5 (1922); R.W. Haines & Lye: fig. 548 (1983); Vanden Berghen: fig. 236 (1988).

Vouchers: *Pooley 1470; C.J. Ward 523, 1229, 2587.*

Description: R.W. Haines & Lye: 270 (1983).

Distribution: Coast, Midlands, Zululand, Maputaland.

Plants distinctive (except perhaps from *P. nitidus*, No. 11) in their development of long trailing branches with leaves (often two-ranked) arising from nodes at intervals along their length; blades often with a bluish tint in life and abscising to leave sheaths enveloping stem (Forbes 1987b). In Natal, plants overhang fresh water, or sandy or muddy alluvium, usually forming an extensive mass, some branches with distal portions floating. The species occurs early in the hydrosere and is a coloniser preceding emergent aquatics. Confusion with *P. nitidus* is possible, especially in herbaria, but *P. mundii* is fractionally less robust (smaller in all its parts, but *P. nitidus* may sometimes be depauperate!) with shorter, darker, dull brown, not shining, spikelets. The most conclusive character distinguishing *P. mundii* is presence on each face of glume, about mid-length, of a narrow membranous, dull brown depression running slightly obliquely to midrib. This is not always easily recognised: in fact it is less well expressed in Natal specimens than in those of tropical Africa. Haines & Lye (1983) report: 'sometimes forming a thick turf on the water surface, giving way but not breaking, under the weight of crocodiles and monitor lizards, but treacherous to man.'

10. **Pycreus niger** *(Ruiz & Pav.) Cufod.* in Bulletin du Jardin Botanique National de Belgique 40 Suppl.: 1443 (1970).

Cyperus niger Ruiz & Pav.: 47 (1798). *C. cimicinus* C. Presl: 166 (1828). *Chlorocyperus cimicinus* (C. Presl) Rikli: 563 (1895). *P. cimicinus* (C. Presl) Pfeifer: 17 (1930) (excl. plants of Africa).

Note: for some time the American plants (distributed from Mexico to Peru) were segregated at specific level from those of Africa, the most significant differences being the longer spikelets and glumes in the former. How-

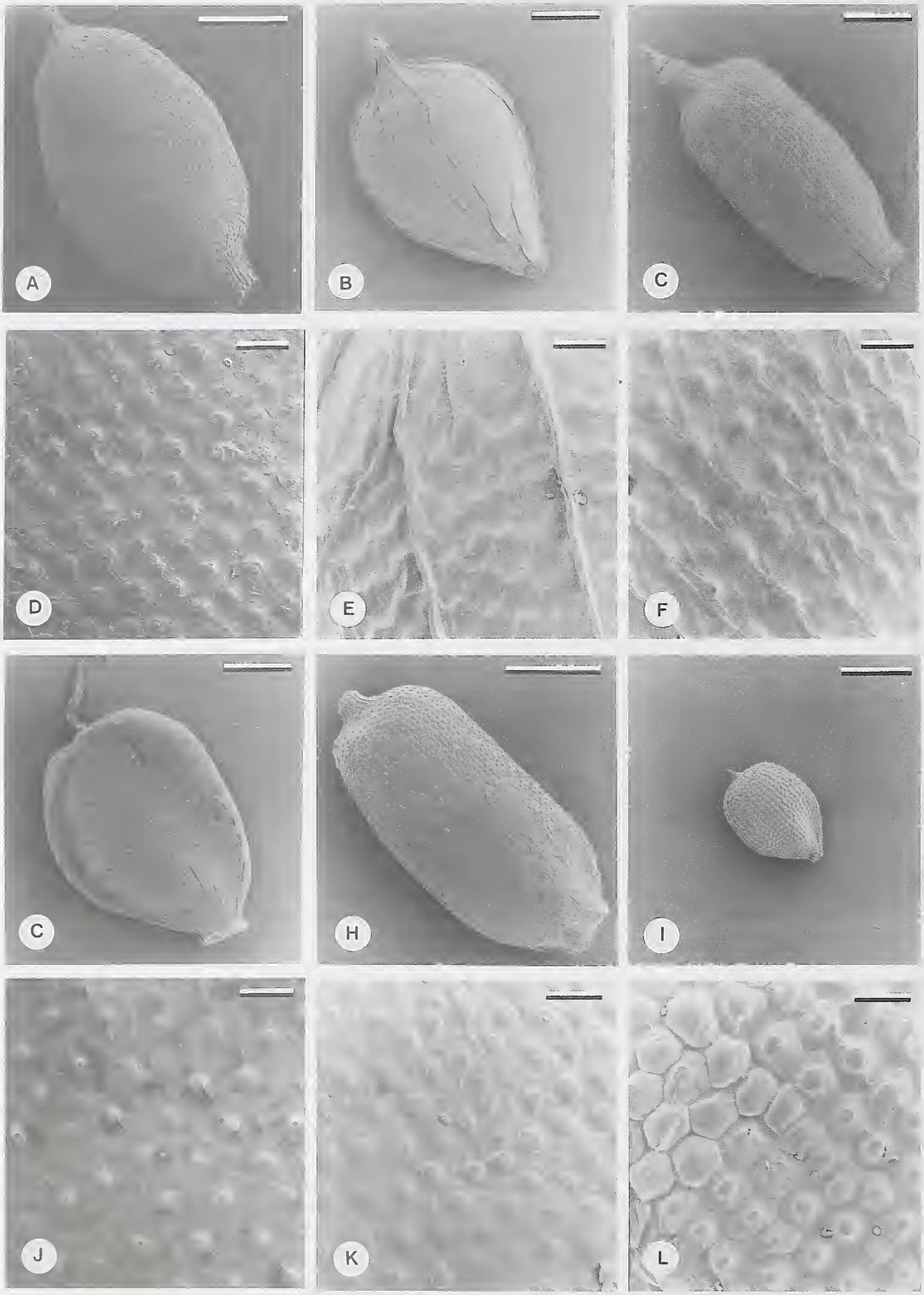

FIGURE 60.—*Pycreus*. A, D, *P. niger* subsp. *elegantulus*, *Johnston 385*; B, E, *P. nitidus*, *J. Browning 163*; C, F, *P. oakfortensis*, *Skead 52*; G, J, *P. pelophilus*, *Schweickerdt 2170*; H, K, *P. polystachyos* subsp. *polystachyos*, *J. Browning 170*; I, L, *P. pumilis* subsp. *patens*, *Letley s.n.* Scale bars: A–C, G–I, 250 µm; D–F, J–L, 25 µm.

ever, Clarke (1901/02) commented 'The South American *Cyperus cimicinus* C. Presl, is identical with the African *P. elegantulus*.' Lye (1981b) and Haines & Lye (1983) recognise the African plants at subspecific level. Without American specimens available for comparison, it seems most satisfactory to follow in the present work, the opinions of the last named authors.

subsp. *niger* (The tropical American expression of the species). Type: from tropical America.

subsp. **elegantulus** *(Steud.) Lye*: 622 (1981b). Type: Ethiopia, prope Demerki, *Schimper 574* (P, holo.). Figure 60A, D.

Cyperus elegantulus Steud.: 583 (1842); Steud.: 11 (1855); Kük.: 342 (1936). *Pycreus elegantulus* (Steud.) C.B. Clarke: 536 (1894b); C.B. Clarke: 160 (1897/98); C.B. Clarke: 302 (1901/02). *C. niger* Ruiz & Pav. subsp. *elegantulus* (Steud.) Lye in R.W. Haines & Lye: 271 (1983); ibid. Appendix 3: 2 (1983d).

Icones: R.W. Haines & Lye: fig. 551 (1983) as *Cyperus niger* subsp. *elegantulus*.

Vouchers: *K.D. Huntley 909; Johnstone 385; Wirminghaus 615.*

Description: C.B. Clarke: 160 (1897/98) as *Pycreus elegantulus*.

Distribution: Coast, Midlands, N Natal.

Plants dark and elegant; small glumes almost black, neatly arranged in compressed spikelet, with conspicuous, although narrow, green or golden keel that gives a 'gold-laced effect' (Haines & Lye 1983). Inflorescences more or less contracted anthelas, branches evident but short, carrying groups of fairly densely packed spikelets. Plants perennial, but appear annual because of their soft, leafy facies. Fragile horizontal underground stolons link the slender tufts, but are not always developed. Grow in wet areas (drainage ditches, permanent vleis, shallow depressions in grassveld) usually where accompanying vegetation is fairly open. There is no other Natal *Pycreus* sp. with which confusion is likely. Stamens are said to be 2 per floret. This needs confirmation for Natal.

11. **Pycreus nitidus** *(Lam.) J. Raynal* in Hooper & J. Raynal in Kew Bulletin 23: 314 (1969). Type: without locality, Herb. Lamarck [P–LA, lectotype selected Raynal in Hooper & J. Raynal (1969)]. Figures 60B, E; 61.

Cyperus nitidus Lam.: 145 (1791); R.W. Haines & Lye: 272 (1983). *C. lanceus* Thunb.: 18 (1794); Thunb.: 101 (1823); Vahl: 350 (1805); Steud.: 6 (1855); C.B. Clarke: 66 (1884); K. Schum.: 117 (1895). *P. lanceus* (Thunb.) Turrill: 67 (1925).

P. umbrosus Nees: 130 (1835); C.B. Clarke: 543 (1894b); C.B. Clarke: 158 (1897/98); C.B. Clarke: 303 (1901/02); Rendle: 107 (1899); Schönland: 22 (1922).

C. umbraticola Kunth: 13 (1837); Boeck.: 443 (1867/68).

Icones: Schönland: t. 7 (1922) as *P. umbrosus*; R.W. Haines & Lye: figs 522, 523 (1983) as *C. nitidus*; Vanden Berghen: fig. 237 (1988).

Vouchers: *J. Browning 163; C.J. Ward 1189, 5211; M.C. Ward 1807.*

Description: R.W. Haines & Lye: 272 (1983).

Distribution: Coast, Midlands, Uplands, Maputaland.

Robust species frequent in wet situations on margins of swamps, streamlets and estuaries where salinity is not high. Plants may grow in great profusion, recognisable by their long stolons (3–8 mm thick and covered in leaf sheaths) that grow through water, muddy silt or swampy grassland extending into leafy aerial tips with rather closely packed blades (2–8 mm) wide. Aerial portions terminate in bare culms ± 300 mm long that carry the always visibly branched anthelate inflorescences of shining brown flattened spikelets. General facies similar to that of *P. mundii* (for differences see that species, No. 9) but *P. nitidus* stronger, larger, bright green, not bluish, with wider leaves and spikelets 3–4 mm wide (generally 2–3 mm in *P. mundii*). There has sometimes been confusion of both these species with plants of *P. macranthus* (No. 7). This is avoidable as *P. macranthus* has transversely undulate achenes (smooth when old). Before achenes are mature the most noteworthy differences are in the inflorescences and stolons: inflorescence branches detectable in *P. nitidus* and *P. mundii*; usually a compact head in *P. macranthus*; stolons more robust and elongate with persistent sheaths in *P. nitidus* and *P. mundii*; shorter, more contracted stolons often accompanied by additional horizontal spreading stolons occur in *P. macranthus*.

12. **Pycreus oakfortensis** *C.B. Clarke* in Flora capensis 7: 159 (1897/98). Syntypes: Transvaal, Lomati Valley, *Galpin 1364* (K); Natal, Oakford, *Rehmann s.n.* (K); Natal, without precise locality *Buchanan 97a, 99* (K), (*Buchanan 100* excl.). Figure 60C, F.

Cyperus oakfortensis (*oakportensis*) Boeck. ex C.B. Clarke: 543 (1894b) name only, as a form of *Pycreus umbrosus* Nees; Kük.: 333 (1936).

P. oakfortensis auct. non C.B. Clarke: Gordon-Gray: 105 (1972); Hilliard & B.L. Burtt: 113 (1987); (?) Hilliard: 54 (1987).

Icones: Nil. Note: Davis in Hilliard: 54 (1987) is not *P. oakfortensis* C.B. Clarke, probably *P. nitidus* (Lam.) J. Raynal.

Vouchers: *K.D. Huntley 429; Killick 1030; N.E. Shirley s.n.* (Highflats).

Description: C.B. Clarke: 159 (1897/98).

Distribution: Coast, Midlands, Uplands.

P. oakfortensis probably takes its name from the locality of Rehmann's syntype (Oakford, near Tongaat, north of Durban). Clarke first placed Boeckeler's entity (in ms.) with *P. umbrosus* (= *P. nitidus*), and later referred to it as possessing 'spikelets rigid, shining black; nut shining black; glumes lanceolate, acute (otherwise as *P. umbrosus* Nees).' The two species should not, however, be confused, for apart from some general similarity in vegetative growth [but *P. oakfortensis* closer in general facies to *P. macranthus* (No. 7) rather than to *P. nitidus*, (No. 11)], the dense head-like inflorescence, the spikelets, glumes and achenes all differ from those of *P. nitidus*, as Clarke indicated. Four of the syntypes obviously represent a single entity. The fifth (*Buchanan 100*) does not agree and should be excluded pending further field study of *P. oakfortensis*. Its basal growth and looser branched anthelate inflorescence do not conform and are suggestive of *P. betschuanus* (No. 2), as this taxon is known in Natal.

In herbaria, the epithet '*oakfortensis*' has frequently been mis-applied to specimens of *P. cooperi* (No. 4). There is some similarity in inflorescence and spikelet form, but the growth form is distinctive. Plants of *P. cooperi* are tufted, usually densely so, shoot bases showing no evidence of stolon development; in contrast plants of *P. oakfortensis* are stoloniferous, shoot bases elongated and descending (not, however, evident in every herbarium specimen). Field work is required to further clarify the differences. *P. cooperi* and *P. macranthus* are sympatric in Upland and Midland vleis, where they may be joined by *P. nitidus* which, with *P. macranthus*, extends to the coast. The possibility of *P. oakfortensis*

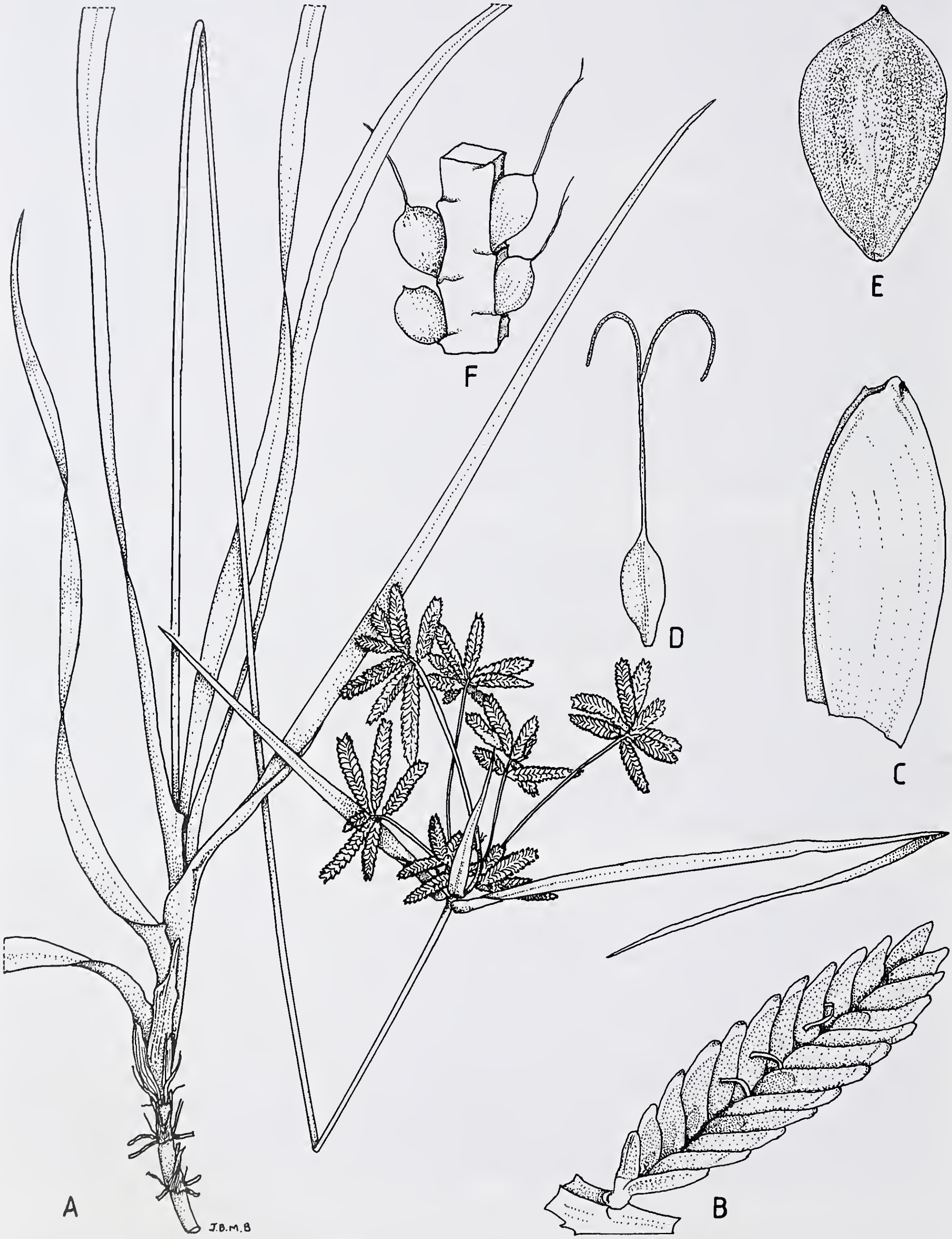

FIGURE 61.—*Pycreus nitidus*, *J. Browning 163*. A, plant, × 1; B, spikelet, × 5; C, glume, lateral view, × 23; D, immature achene with style and style branches, × 16; E, achene, × 10; F, rachilla, with glumes removed: note achenes edge on to the rachilla, × 12.

having had a hybrid origin with, now, a range in variation represented within the limits ascribed to the species, must not be ignored. Natal plants such as *Buchanan 100* (K) (see above) and others tentatively placed with *P. betschuanus* may possibly also be variants related in some way to the total species plexus.

13. **Pycreus pelophilus** *(Ridl.) C.B. Clarke* in Conspectus florae africae 5: 540 (1894b); Rendle: 109 (1899); C.B. Clarke: 298 (1901/02); Podlech: 42 (1967). Syntypes: Angola, *Welwitsch 6887, 7025, 7082*. Figure 60G, J.

Cyperus pelophilus Ridl.: 129 (1884); Kük.: 364 (1936); R.W. Haines & Lye: 289 (1983).

P. sulcinux C.B. Clarke: 542 (1894b); C.B. Clarke: 298 (1901/02) non C.B. Clarke: 593 (1893/94) African plants only.

Icones: R.W. Haines & Lye: figs 599, 600 (1983).

Vouchers: *O. Letley s.n.; Pooley 1643*.

Description: R.W. Haines & Lye: 289 (1983).

Distribution: Zululand, Maputaland.

Not common in Natal. Slender annuals with a solitary main shoot, or sparsely tufted, up to about 200 mm in height, growing in alluvium on edges of seasonal pools, wallows or streamlet margins. Where the species is represented it may be locally gregarious; but it is easily missed, because plants are soon overtaken by more robust vegetation. Culms triangular, leaves firm, erect and inflorescence a bracteate, open anthela carrying greenish to golden brown spikelets. Features aiding in identification are the zig-zag spikelet rachilla carrying somewhat spreading glumes (at least at maturity); stamens 2 per floret; flattened achenes with ridges asymmetric above base (one projecting more than the other); achene surface with longitudinal rows of minute projections.

14. **Pycreus polystachyos** *(Rottb.) P. Beauv.*, Flore d'Oware et de Benin, en Afrique 2: 48 (1816); Nees: 283 (1834b); C.B. Clarke: 540 (1894b); C.B. Clarke: 157 (1897/98); C.B. Clarke: 296 (1901/02); Rendle: 108 (1899); Schönland: 22 (1922); Podlech: 42 (1967). Type: India, *Rottboell s.n.* (lectotype C) as *Cyperus polystachyos*.

Cyperus polystachyos Rottb.: 39 (1773); Vahl: 315 (1805); Kunth: 13 (1837); Steud.: 8 (1855); Boeck.: 477 (1867/68); Kük.: 367 (1936); R.W. Haines & Lye: 279 (1983).

Chlorocyperus polystachyos (polystachyus) (Rottb.) Rikli: 563 (1895).

Icones: Rottb.; t. 11, fig. 1 (1773); P. Beauv.: t. 86, fig. 2 (1816); Schönland: t. 6 (1922); R.W. Haines & Lye: figs 571, 572 (1983); Vanden Berghen: fig. 238 (1988).

Vouchers: *J. Browning 170; C.J. Ward 267, 2108*.

Description: R.W. Haines & Lye: 279 (1983).

Distribution: Coast, Midlands, Maputaland.

Cosmopolitan in tropical and subtropical regions extending into warm-temperate climates. The species has received many names; only the most familiar synonyms are given above. Infraspecific categories are numerous [Kükenthal (1936), recognised eleven varieties; Haines & Lye (1983), for East Africa, two subsp.]. Of Kükenthal's varieties only the typical one and var. *laxiflorus* (Benth.) C.B. Clarke are relevant to Natal. Var. *laxiflorus* is based on an Australian type and distinguished by an open, anthelate inflorescence with spikelets laxly arranged upon rays. Haines & Lye (1983) treated this phase of the species as subsp. *laxiflorus* (Benth.) Lye. Only one record is known for Natal, namely *Gueinzius 12* (Kükenthal 1936) (not seen: confirmation of locality required). Because of its poor representation (if present at all?) var. *laxiflorus* is not recorded for Natal in this work. Most herbarium specimens are probably placed with *P. intactus* (No. 6) which intergrades.

subsp. **polystachyos** (Figure 60H, K)

In the typical phase the inflorescence is a congested head of numerous crowded spikelet clusters, the branches that bear them short, hardly visible without dissection.

Tufted perennials lacking stolons (in sea-facing situations very robust). Young plants may appear annual and may only survive one season if conditions are unfavourable. Grow in open, often disturbed, moist areas of short grassland. Most easily recognised by numerous linear spikelets compacted into heads; oblong achenes approximately twice as long as wide. Relationship is with *Pycreus intactus* (No. 6) but the linear, rather dull brown spikelets of *P. polystachos* differ from the basally lanceolate, greenish red (eventually slightly shining brown) spikelets of *P. intactus*.

15. **Pycreus pumilis** *(L.) Nees* in Linnaea 9: 283 (1834b) name; Nees ex C.B. Clarke: 591 (1893/94), concerning nomenclature, but excl. basionym (see note by C.B. Clarke: 296 (1901/02); Domin: 417 (1915); Turrill: 124 (1922); Podlech: 42 (1967); P.L. Forbes: 57 (1987b).

Cyperus pumilis L.: 6 (1756); Kük.: 375 (1936); Kern: 650 (1974).

P. nitens Nees: 53 (1843); C.B. Clarke: 591 (1893/94); C.B. Clarke: 295 (1901/02). *Dichostylis nitens* (Nees) Palla: 296 (1889).

subsp. *pumilis*

From India, through Indo-China and southern China eastwards to Malesia and Australia.

subsp. **patens** *(Vahl) Podlech*: 523 (1960). Type: West Africa, Guinea, *Thonning s.n.* (C). Figure 60I, L.

Cyperus patens Vahl: 334 (1805); Kunth: 16 (1837); Steud.: 10 (1855). *P. patens* (Vahl) Cherm.: 11 (1931). *Dichostylis patens* (Vahl) Palla: 296 (1889). *C. pumilis* L. var. *patens* (Vahl) Kük.: 378 (1936); R.W. Haines & Lye: 290 (1983).

Icones: R.W. Haines & Lye: figs 602, 603 (1983) as *C. pumilis* var. *patens*; Vanden Berghen: fig. 241 (1988) as *P. pumilis* including var. *patens*.

Vouchers: *K.D. Gordon-Gray s.n.; Letley s.n.; Pentz & Acocks 10265* (PRE).

Description: R.W. Haines & Lye: 290 (1983) as *C. pumilis* var. *patens*; Vanden Berghen: fig. 241 (1988) as *P. pumilis* including var. *patens*.

Distribution: Midlands, Zululand.

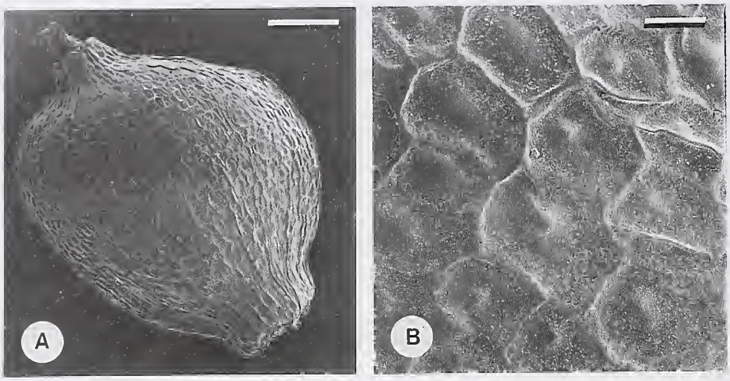

FIGURE 62.—*Pycreus unioloides, Killick 1627.* Scale bars: A, 250 µm; B, 25 µm.

Small, leaf-bearing annuals with poorly developed rooting system; leaf sheaths often tinged with purple at base; anthelate, bracteate inflorescence, carrying greenish to reddish brown spikelets. Subsp. *patens* differs from typical phase in its glumes which are imbricate when young but which later spread apart, losing contact with one another and exposing achenes, which are almost whitish when young, becoming dark with a shine when fully mature, possibly because of lifting of outermost pericarp walls. Note: some authorities no longer uphold varietal segregation for the African plants (Hooper 1972; Reid 1986.) There is similarity with *P. pelophilus* (No. 13) in general facies, but *P. pumilis* subsp. *patens* may be distinguished by its laxly arranged, clearly mucronate glumes and its achenes that are not markedly flattened laterally and with symmetrical sides (see also under *P. pelophilus*). Not common in Natal. Plants grow in wet alluvium, or in moist depressions in disturbed grassveld, or in moist moss-covered soil over rock, where competition from taller vegetation is reduced.

16. **Pycreus unioloides** *(R. Br.) C.B. Clarke* in Symbolae 2: 164 (1900); Domin: 417 (1915); Podlech: 42 (1967); P.L. Forbes: 58 (1987b). Type: from Australia. Figure 62.

Cyperus unioloides R. Br.: 216 (1810); Kunth: 112 (1837); Steud.: 54 (1855); Kük.: 338 (1936); R.W. Haines & Lye: 273 (1983).

C. angulatus Nees: 73 (1834a); Steud.: 12 (1855); Boeck.: 465 (1867/68). *P. angulatus* (Nees) Nees: 283 (1834b); C.B. Clarke: 534 (1894b); C.B. Clarke: 160 (1897/98); C.B. Clarke: 305 (1901/02); Schönland: 23 (1922).

Icones: C.B. Clarke: t. 4, figs 1–5 (1909); Schönland: t. 8 (1922) as *P. angulatus*; R.W. Haines & Lye: fig. 555 (1983) as *C. unioloides*; Vanden Berghen: fig. 243 (1988).

Vouchers: *K.D. Huntley 428; Guy & Ward 54; C.J. Ward 727.*

Description: R.W. Haines & Lye: 273 (1983) as *C. unioloides*.

Distribution: Coast, Midlands, Uplands, Zululand.

Pantropically distributed and consequently has received many names. In Natal, plants leafy, tufted short-lived perennials (sometimes annual) without stolons, but often with a short, soft rhizome linking adjacent tufts. This rhizome, or its remnant, may be detected amongst roots of main plant in herbarium specimens: it is not always represented as, apart from sometimes not being developed, it soon dies away. Readily distinguished by its fairly wide (4–5 mm) spikelets that are yellowish fawn to putty-brown in colour. Favoured habitats are vleis with permanent water or very wet depressions in short grassland. Plants frequently grow in standing water and may be sympatric with *P. macranthus*. Occasionally in an individual vlei, plants with a range of spikelet colours from deep blackish red, through light red, to bright yellow, to the putty-fawn of *P. unioloides* have been observed. The possibility of survival of hybrids between *P. macranthus* (No. 7) and *P. unioloides* seems a reasonable interpretation, but requires investigation.

0492000 **RHYNCHOSPORA**

Rhynchospora *Vahl* orth. et nom. conserv., Enumeratio plantarum 2: 229 (1805) ('Rynchospora' corrected Willd., Enumeratio plantarum: 71 (1809); C.B. Clarke: 652 (1894b); C.B. Clarke: 267 (1897/98); C.B. Clarke: 478 (1901/02); Schönland: 54 (1922); Kük.: 90 (1950); Kük.: 273 (1951); Podlech: 43 (1967); R.A. Dyer: 887 (1976); Van Laren: 82 (1979); R.W. Haines & Lye: 312 (1983). Type: *R. alba* (L.) Vahl (*Schoenus albus* L.), type conserved.

Key to species

1a Inflorescence a solitary compact head terminating culm 2
1b Inflorescence of more than one compact head, or otherwise different 3

2a Plants tufted, never stoloniferous. Achene more or less covered in hair-like outgrowths. Style base shorter than achene, together not longer than 3 mm .... 7. *R. rubra*
2b Plants tufted and stoloniferous. Achene with a few scabrid or hair-like outgrowths on 'shoulders' only. Style base as long as or longer than achene, together equalling or longer than 3 mm .... 5. *R. holoschoenoides*

3a Large robust plants with leaf blades 9–18 mm wide. Spikelets 8–20 mm long. Achene and style base together longer than 6 mm .... 3. *R. corymbosa*
3b Medium-sized to slender, OR short and spreading plants with leaf blades not wider than 3 mm. Spikelets shorter than 8 mm. Achene and style base together shorter than 6 mm 4

4a Very delicate, slender, sinuous plants difficult to disentangle from supporting vegetation. Leaf blades 0.5–1.0 mm wide. Spikelet rachilla sinuous. Mature achene square in outline .... 4. *R. gracillima*
4b Plants of medium development, EITHER tufted, erect and perennial, OR more spreading (sometimes culms decumbent) and annual. Leaf blades up to 3 mm wide. Spikelet rachilla not sinuous. Mature achenes not square in outline 5

5a Plants annual, tufted to diffuse and spreading, sometimes culms decumbent, rooting from lower nodes. Achene coarsely transversely rugose. Persistent style base bilobed, wider than deep, extending epaulette-like over 'shoulders' of achene .... 6. *R. perrieri*
5b Plants perennial, EITHER tufted (never stoloniferous), erect, slender to medium in development with style base of achene triangular, OR tufted and stoloniferous, erect, medium-robust to coarse with style base of achene long and narrow 6

6a Style base as long as or longer than achene, together equalling or exceeding 3 mm. Achene with a few scabrid or hair-like outgrowths on 'shoulders'. Plants sparsely-tufted, medium-robust to coarse, stoloniferous .... 5. *R. holoschoenoides*
6b Style base not longer than 1.0 mm, shorter than glabrous achene (hairs present at bases of hypogynous bristles). Plants slender to medium-robust, tufted, never stoloniferous 7

7a Inflorescence branches developed from uppermost 1–3 culm nodes and carrying lax units (longer than wide) of 15–25(–30 and sometimes more) spikelets usually sequentially arranged. Bracts of inflorescence and tips of uppermost cauline leaves seldom exceeding terminal spikelet unit, therefore not conspicuous .... 2. *R. brownii**
7b Inflorescence branches developed from uppermost 1–2(–3) culm nodes and carrying dense usually compact heads or pseudo-heads [usually wider than long(deep)] of (20–)30–50(–80) closely massed spikelets. Tips of uppermost cauline leaves usually overtopping or lateral to terminal spikelet head, therefore conspicuous .... 1. *R. barrosiana**

* Note: plants bearing only immature inflorescences are difficult to distinguish.

1. **Rhynchospora barrosiana** *Guagl.* in Darwiniana 22: 287 (1979); Van Laren *et al.*: 498 (1989). Type: Argentina, Corrientes, Depto Mercedes, 55 km al Norte de Mercedes, *Burkart et al. 29738* (SI, holo.; CTES, K, LIL, LP, MUM, NU, NY, P, iso.). Figure 63A, D.

Icones: Guagl.: figs 12–14 (1979); Van Laren *et al.*: figs 3C, D; 4B (1989).

Vouchers: *J. Browning 337; Tinley 360, 362; C.J. Ward 2926, 5509, 5458, 8875, 8879, 9100.*

Description: Van Laren *et al.*: 504 (1989).

Distribution: Coast, northern Midlands, Zululand, Maputaland.

R. barrosiana is very closely related to *R. brownii*, in association with which it often grows along the Natal coast. Head-like inflorescence (see key), fractionally shorter achenes and slightly more robust plants are the most reliable means of recognizing *R. barrosiana*. There is also a difference in distribution: *R. brownii* occurs quite commonly inland up to altitudes of 2 100 m, whereas furthest inland locality recorded for *R. barrosiana* is Weenen.

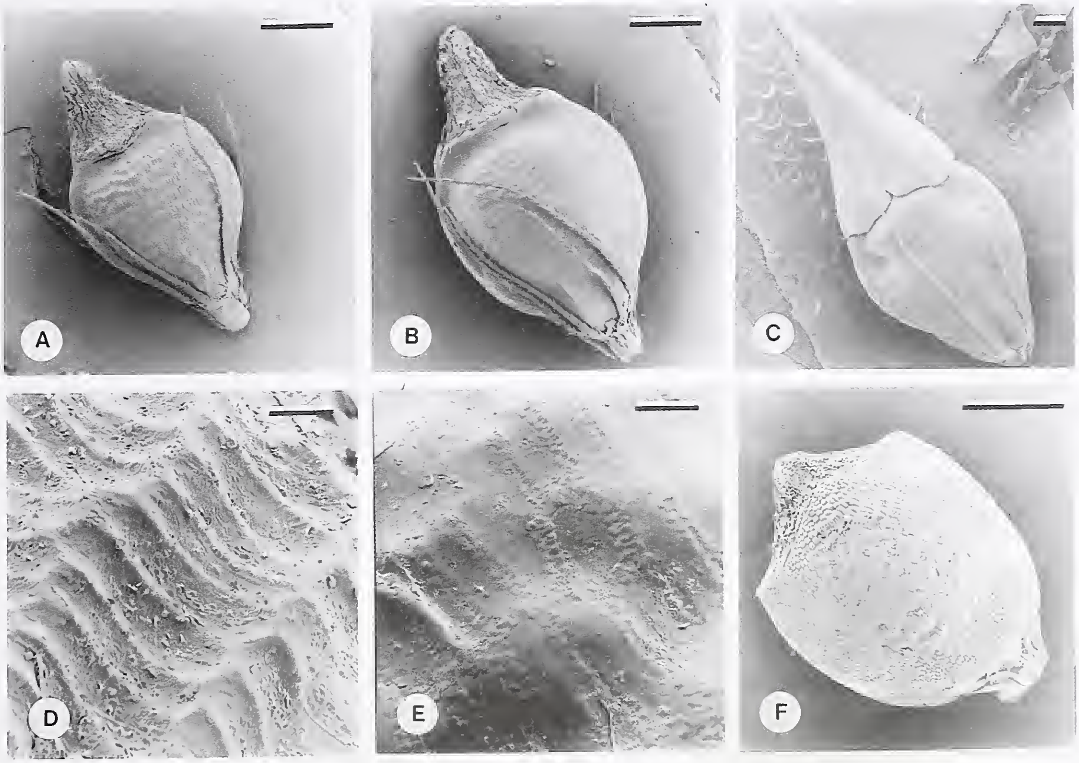

FIGURE 63.—*Rhynchospora.* A, D, *R. barrosiana, J. Browning 337*; B, E, *R. brownii, J. Browning 153*; C, *R. corymbosa, Ward 4950*; F, *R. gracillima* subsp. *subquadrata, Robinson 3318.* Scale bars: A–C, F, 500 μm. D, E, 25 μm.

This species is hardly represented above 1 000 m. Perennial, tufted plants grow in gently moving water of open vleis and streamlet banks, or in very wet soil.

2. **Rhynchospora brownii** *Roem. & Schult.*, Systema vegetabilium 2: 86 (1817); E.A. Rob.: 36 (1961); Guagl.: 267 (1979); R.W. Haines & Lye: 317 (1983); Hilliard: 59 (1987); Hilliard & B.L. Burtt: 115 (1987); Van Laren *et al.*: 498 (1989). Type: New Holland (New Zealand), Endeavour River, *Banks & Solander s.n.* (BM, lecto.). Figures 63B, E; 64.

R. laxa R. Br.: 230 (1810) non Vahl; Kunth: 298 (1837); C.B. Clarke: 118 (1908). *R. glauca* sensu auct. C.B. Clarke: 671 (1893/94); C.B. Clarke: 654 (1894b); C.B. Clarke: 268 (1897/98); C.B. Clarke: 482 (1901/02); Schönland: 55 (1922) non Vahl. *R. rugosa* sensu auct., Napper: 41 (1964); Podlech: 44 (1967) non (Vahl) Gale.

Rhynchospora glauca Vahl var. *condensata* Kük.: 259 (1938b). *R. brownii* Roem. & Schult. var. *condensata* (Kük.) Ohwi: 205 (1942). *R. rugosa* (Vahl) Gale var. *condensata* (Kük.) T. Koyama: 130 (1961). Type: New Guinea, Mt Sarawaket, *Clemens 5543* (K).

Icones: Schönland: t. 59 (1922); Guagl.: figs 3, 4, 5d–g (1979); R.W. Haines & Lye: figs 653, 654 (1983); Davis in Hilliard: 59 (1987); Van Laren *et al.*: figs 3A, B, 4A (1989).

Vouchers: *J. Browning 153; K.D. Huntley 453, 783; Moll 4776; C.J. Ward 3645, 4943, 8109, 8833, 9167.*

Description: Van Laren *et al.*: 502 (1989).

Distribution: widespread.

Frequent in Natal. Slender, erect perennials growing gregariously along stream margins, on edges of vleis and in water or damp soil surrounding or overlying rock sheets; usually in aerobic habitats. One of the few sedges well represented in Natal that extends almost to Cape Peninsula.

3. **Rhynchospora corymbosa** *(L.) Britton* in Transactions of the New York Academy of Science 11: 84 (1892); E.A. Rob.: 35 (1961); Napper: 41 (1964); Podlech: 43 (1967); Van Laren: 89 (1979); R.W. Haines & Lye: 313 (1983). Type: India, Herb. Linnaeus 71.48 (LINN, holo.). Figure 63C.

Scirpus corymbosus L.: 76 (1756); L.: 303 (1759); *R. aurea* Vahl: 229 (1805); C.B. Clarke: 653 (1894b); C.B. Clarke: 268 (1897/98); C.B. Clarke: 480 (1901/02).

R. spectabilis Hochst.: 760 (1845); C.B. Clarke: 654 (1894b); C.B. Clarke: 268 (1897/98). Type: Natal, ponds near Umlaas River, *Krauss 210* (K, holo.).

Icones: Van Laren: figs 1, 4, 8(1), 38, 40 (1979); R.W. Haines & Lye: fig. 643 (1983); Vanden Berghen: fig. 247 (1988).

Vouchers: *Edwards 2555; Pooley 1817a, 2103a; C.J. Ward 720, 4950, 5510, 7740; Wood 4001.*

Description: Van Laren: 90 (1979).

Distribution: Coast, Maputaland.

Robust perennial with broad leaves and tall inflorescence that occupies lowland coastal swamps along entire Natal seaboard at altitudes below 1 010 m (more frequent north than south). Because of its size, sometimes confused with taller species of *Scleria, Cladium mariscus* and *Carpha glomerata*, but dissection of a spikelet to show the very long pyramidal style base persistent on achene should make its identity quite certain.

Near Durban (the type locality of *R. spectabilis*), cymes contracted and head-like, differing from more elongated examples further north. Reduction is gradual and does not warrant infraspecific recognition.

4. **Rhynchospora gracillima** *Thwaites*, Enumeratio plantarum zeylaniae; 435 (1864); C.B. Clarke: 671 (1893/94); Kük.: 273 (1951); Kern: 721 (1974); T. Koyama: 340 (1985). Type: Ceylon, Hewessa, *Thwaites C.P. 3818* (K, L).

subsp. *gracillima*

Densely tufted annuals or short-lived perennials from Ceylon (Sri Lanka), India, Thailand, southeastern China, Malesia and Australia. Robinson (1961) distinguished *R. gracillima* from the African *R. subquadrata* Cherm. on a difference in the number of transverse corrugations on the face of the achene (6–8 in the former; 10–12 in the latter). Raynal (1967b), on this single feature of distinction, interpreted *R. subquadrata* as a geographic race and reduced it to subspecific ranking. This was accepted by Hooper (1972) and is followed here.

subsp. **subquadrata** *(Cherm.) J. Raynal* in J. & A. Raynal in Adansonia 7: 321 (1967); Hooper in Hooper & Napper: 331 (1972); Van Laren: 123 (1979); R.W. Haines & Lye: 315 (1983). Syntypes: Madagascar, Firingavala, *Perrier de la Bâthie 920*; Tamatave, *Viguier & Humbert 397* (P). Figure 63F.

R. subquadrata Cherm.: 720 (1922); Cherm.: 221 (1936/37); E.A. Rob.: 40 (1961); Napper: 41 (1964).

R. testui Cherm.: 42 (1931). Syntypes: Congo, Haut-Oubangui Mangapou, 75 km W of Yalinga, *Le Testu 3123*; River Kpalato, near Bambari, *Tisserant 411* (BR).

Icones: R.W. Haines & Lye: figs 648, 649 (1983); Vanden Berghen: fig. 249 (1988).

Voucher: *C.J. Ward 8878.*

Description: Van Laren: 125 (1979); R.W. Haines & Lye: 315 (1983).

Distribution: Maputaland.

In Natal subsp. *subquadrata* is poorly known. There is one good collection and a few fragments taken inadvertently. Plants are so spindly and so closely threaded through associated vlei vegetation [especially *R. brownii* (No. 2) and *R. barrosiana* (No. 1)] that they are readily overlooked. Recognised by sinuous rachilla of spikelet, squareness of achene and absence of hypogynous bristles. Should be carefully searched for in Maputaland and southwards along the coast to determine distributional limits. Well grown examples are not uncommon in eastern Zimbabwe.

5. **Rhynchospora holoschoenoides** *(Rich.) Herter* in Revista Sudamericana de botanica: 157 (1953); Napper: 41 (1964); J. Raynal in J. & A. Raynal: 321 (1967); Peyre de Fabregues & Lebrun: 163 (1969); Hooper in Hooper & Napper: 329 (1972); Van Laren: 92 (1979); R.W. Haines & Lye: 314 (1983). Type: West Indies, Herb. L.C. Richard (P, holo.). Figure 65A.

Schoenus holoschoenoides Rich.: 106 (1792).

S. cyperoides Sw.: 19 (1788). *R. cyperoides* (Sw.) Mart.: 149 (1816/17); C.B. Clarke: 653 (1894b); C.B. Clarke: 267 (1897/98); C.B. Clarke: 479 (1901/02); Schönland: 55 (1922); comb. illeg. [based on *Schoenus cyperoides* Sw. (1788), non Retz. (1786/87)].

R. mauritii Steud.: 149 (1855); E.A. Rob.: 34 (1961); Podlech: 44 (1967). Type: Ex Hrbo Urville decta in Ins. Mauritii.

R. arechavaletae Boeck.: 24 (1888); Podlech: 118 (1961); Podlech: 44 (1967). Type: from Uruguay.

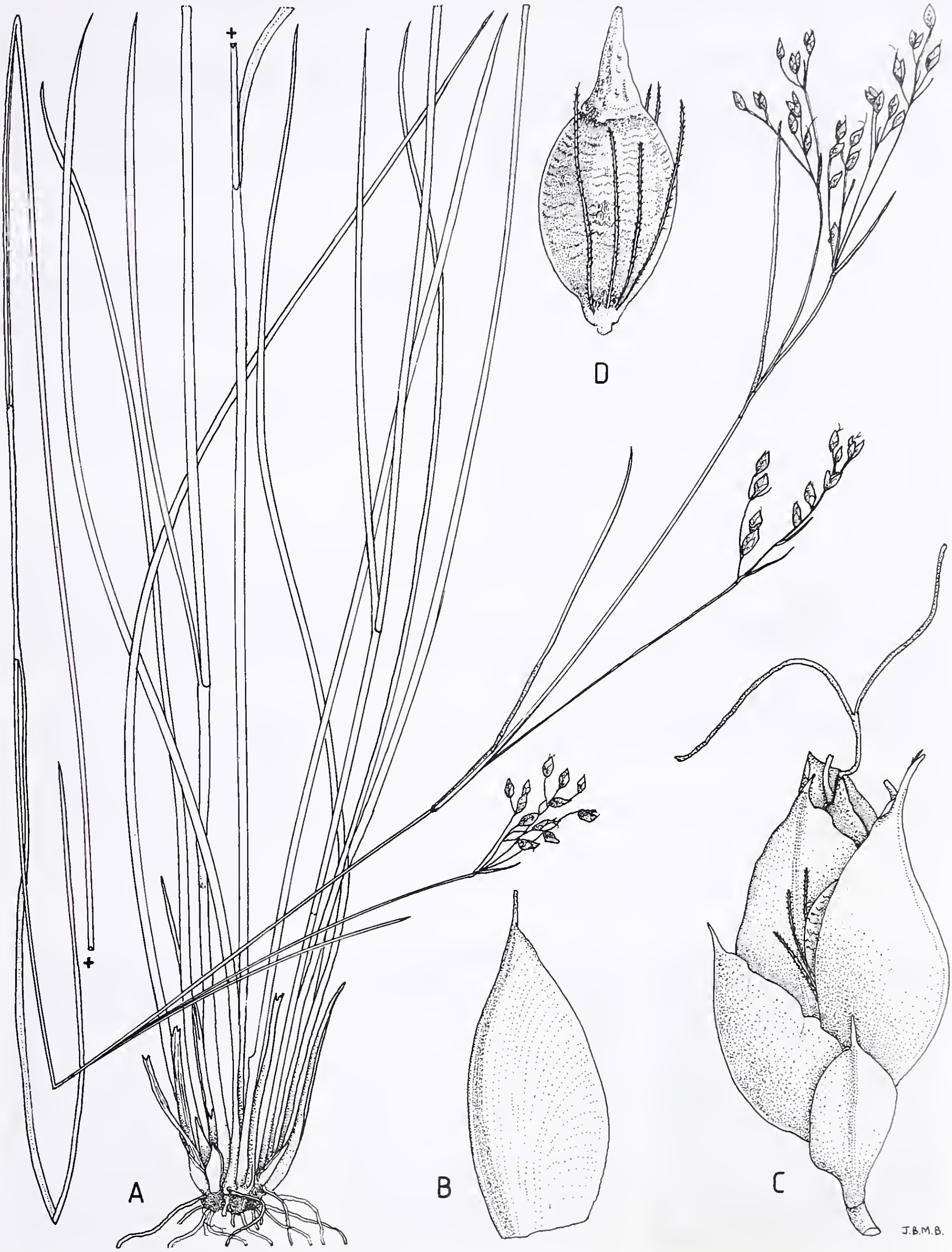

FIGURE 64.—*Rhynchospora brownii, J. Browning 153.* A, plant, × 1; B, glume, lateral view, × 18; C, spikelet with two achenes, × 17; D, achene and hypogynous bristles, × 19.

Icones: C.B. Clarke: t. 67, figs 5–8 (1909); Schönland: t. 58 (1922); Van Laren: figs 2, 5, 8(6), 9A(4), 41 (1979); R.W. Haines & Lye: figs 644, 645 (1983); Vanden Berghen: fig. 250 (1988).

Vouchers: *K.D. Gordon-Gray 6029, 6239; C.J. Ward 1180, 2925, 4944, 5210, 5520.*

Description: Van Laren: 93 (1979); R.W. Haines & Lye: 314 (1983).

Distribution: Coast, Maputaland (altitudes below 1 010 m).

There have been differences of opinion as to whether the South American plants (*R. holoschoenoides*) should be kept distinct from those of Africa (*R. cyperoides*). Most recent workers accept them as conspecific. In Natal, *R. holoschoenoides* readily recognised by general facies, being markedly different from other species of the genus in presence of stolons and in the inflorescence. This last is very variable. Typically it consists of a globose quasi-head terminating culm, accompanied by 1–3 or more lateral branches forming an anthela with, or without, additional branches from lower culm nodes. *R. arechavaletae* accommodated one-headed inflorescences said to be correlated with longer achenes. This correlation does not hold for southern African plants, however, all of which are included under *R. holoschoenoides* without infraspecific distinction, by Van Laren (1979). Sparsely tufted perennial plants common in wet and very moist situations usually on sand, often where there is some impediment to drainage. Aerial parts die under conditions of prolonged stagnation, but rhizomes persist to shoot when aeration is restored.

6. **Rhynchospora perrieri** *Chern.* in Bulletin Société botanique de France 69: 721 (1922); Kük.: 279 (1951); E.A. Rob.: 40 (1961); Napper: 41 (1964); J. Raynal in J. & A. Raynal: 322 (1967); Van Laren: 117 (1979); R.W. Haines & Lye: 319 (1983). Syntypes: Madagascar, Berizoka, *Perrier de la Bâthie 305*; Ile Mahakamby, *Waterlot 565* (P). Figure 65B.

R. deightonii Hutch.: 468 (1936). Syntypes: Sierra Leone, Malema, *Deighton 326*; Newton, *Deighton 1449*; Southern Province between Gboyama and Bendu, *Deighton 1633* (K).

Icones: Van Laren: figs 8(3), 9A(1), 48 (1979); R.W. Haines & Lye: figs 657, 658 (1983); Vanden Berghen: fig. 251 (1988).

Vouchers: *I'Ons 114/82, 122/82, 3/83; C.J. Ward 2864, 4820, 5537, 8881, 8885, 9746.*

Description: Van Laren: 117 (1979); R.W. Haines & Lye: 319 (1983).

Distribution: Coast, Maputaland (altitudes below 700 m).

Soft-textured, sometimes erect, sometimes spreading, but always inconspicuous, annual or short-lived perennial. It is a pioneer in that it spreads through moist areas that have become open due to some previous disturbance. Most easily recognised by achene that has coarsely transversely wavy surfaces and a persistent, slightly bilobed style base that caps each 'shoulder' as would an epaulette.

7. **Rhynchospora rubra** *(Lour.) Makino* in Botanical Magazine, Tokyo 17: 180 (1903); Kük.: 52 (1924); Kük.: 491 (1949); Kern: 715 (1974); T. Koyama: 340 (1985). Type: from Cochin-China.

Schoenus ruber Lour.: 41 (1790).

Morisia wallichii Nees: 265 (1834c). *R. wallichiana* Kunth: 289 (1837); C.B. Clarke: 668 (1893/94). Type: from Nepal.

subsp. *rubra*

Tufted annuals or short-lived perennials bearing bracteate, rather small, head-like inflorescences of closely compacted sessile spikelets terminating almost nodeless culms. Considerable range in development of bristles, shape of achenes and other criteria, including hairiness. Widespread in the East, from India, through China and Japan, to Malesia, Australia and Oceania.

There have been differences of opinion as to the systematic ranking that should be adopted for very similar plants occurring in Madagascar and Africa (a brief summary is given by Van Laren 1979). J. Raynal (1967b) recognised for these countries, four subspecies (considering the variant entities as geographic races of the widespread eastern typical phase). Of these, two are in Madagascar, two in Africa. The only one relevant to Natal is:

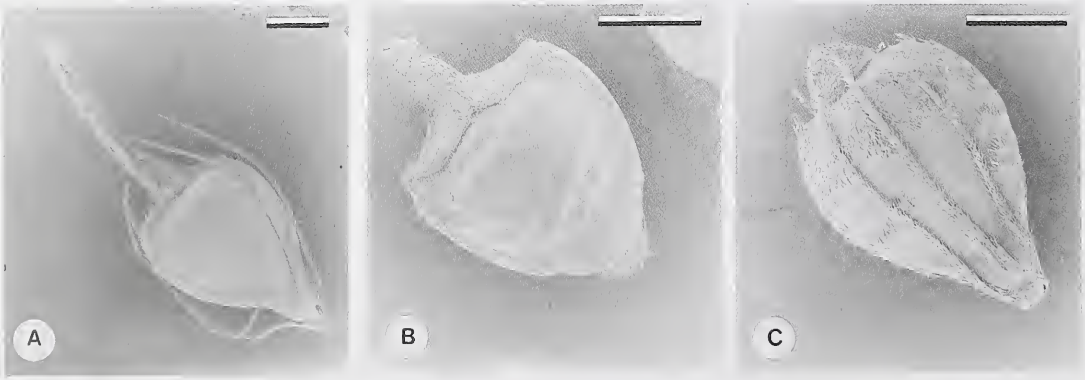

FIGURE 65.—*Rhynchospora*. A, *R. holoschoenoides, K.D. Gordon-Gray 6239*; B, *R. perrieri, Ward 4820*; C, *R. rubra* subsp. *africana, I'Ons 32/81.* Scale bars: A–C, 500 µm.

subsp. **africana** *J. Raynal* in J. & A. Raynal in Adansonia 7: 323 (1967); J. Raynal: 522 (1967b); Hooper in Hooper & Napper: 329 (1972); Van Laren: 121 (1979); R.W. Haines & Lye: 314 (1983). Type: Tanzania, Mafia Island, Dundani, *Fitzgerald 5216* (K, holo.; EA, iso.). Figure 65C.

R. minor Nelmes: 533 (1957) non Nees (1842). *R. wallichiana* sensu C.B. Clarke: 478 (1901/02) non (Nees) Kunth. *R. parva* sensu Napper: 41 (1964) non (Nees) Steud.

Icones: Van Laren: figs 6, 8(2), 9A(2), 49 (1979); R.W. Haines & Lye: figs 646, 647 (1983); Vanden Berghen: fig. 252 (1988).

Vouchers: *K.D. Gordon-Gray 6184; I'Ons 32/81; E.A. Robinson 5526; C.J. Ward 8873, 9078.*

Description: Van Laren: 121 (1979).

Distribution: Coast, Maputaland.

Subsp. *africana* is commoner in Natal than recorded collections suggest. It has been known in this province only since 1963 (from Richard's Bay). Subsequent field study has revealed its presence at Uvongo and thereabouts, but an hiatus does appear to exist between 29° and 30°S latitude. This may be interpreted as the result of human development of this zone, but such explanation does not account for the absence of early records. *R. rubra* subsp. *africana* is readily recognizable by its compact leafy tufts surmounted by few-noded culms each terminated by a neat, bracteate head giving some impression of a diminutive yellowish, double chrysanthemum. The achenes are also characteristic since they carry upward-pointing hair-like outgrowths.

0468010 SCHOENOPLECTUS

Schoenoplectus *(Rchb.) Palla* in Verhandlungen der kaiserlich-königlichen zoologisch-botanischen Gesellschaft in Wien 38, Sitzungsberichte: 49 (1888); Palla: 298 (1889); J. Raynal: 537 (1976b); K.L. Wilson: 157 (1981); R.W. Haines & Lye: 52 (1983). Type species: *Schoenoplectus lacustris* (L.) Palla (= *Scirpus lacustris* L.)

Scirpus L. section *Actaeogeton* Rchb.: 78 (1830); T. Koyama: 284 (1958).

Some authorities (Raynal 1976b; Wilson 1981), suggest that *Schoenoplectus* is the pantropical element amongst the *Scirpus sensu lato* segregates, and of African origin. The genus is certainly well represented in tropical Africa, from where it extends southwards, by way of about a dozen species, to Natal and the eastern Cape.

Key to species

Note: identification is not always straightforward. Unusual plants that appear to be the outcome of interspecific hybridisation, with or without subsequent backcrossing, are sometimes encountered.

1a Perianth segments regularly present 2
1b Perianth segments entirely absent or present as rudiments, sometimes in a few florets of a spikelet only. (In *S. pulchellus* (No. 11) 2 or 3 minute outgrowths are regularly developed at base of achene) 4

2a Perianth segments plumose .... 7. *S. litoralis*
2b Perianth segments retrorsely scabrid or smooth 3

3a Glumes 1.9–2.8 mm long. Anthers oblong, shorter than 1.0 mm. Bristles 5(–6) in every floret of spikelet ..... 10. *S. paludicola*
3b Glumes 2.8–4.5 mm long. Anthers linear, 1.0–1.75 mm long. Bristles 0–6. When present, usually variable in number and size per floret of a spikelet (southern Natal; possibly southern Drakensberg) .... 4. *S. decipiens*

4a Achenes markedly transversely ridged (visible even when young) 5
4b Achenes smooth (faint transverse undulations may be present, but not well-marked ridges) 10

5a Plants perennial; short rhizome bearing closely approximated, often uniseriate, shoot bases. Main inflorescence bract never exceeding culm length. Style-branches 3 (occasionally 2 in spikelets where 3 predominate). Amphicarpy unknown 6
5b Plants annual; rhizome hardly developed, linking the tufted shoots. Main inflorescence bract equalling or exceeding culm length (if shorter, then culm often with 1–2 nodes, each bearing a leaf sheath and ± reduced blade). Amphicarpy often exhibited (look for style branches extending out from basal sheaths) 8

6a Glumes brown (not pallid except keel) overlaid by darker brown inverted V apically on either side of pallid keel. Ligule of uppermost leaf sheath 0.2–0.6 mm. Dry culms 10 mm below inflorescence, 1.0–2.0 mm in diameter .... 9. *S. muriculatus*
6b Glumes pallid, straw-coloured or pale green with dark brown blackish inverted V apically on either side of keel. Ligule of uppermost leaf sheath 0.5–1.8 mm (usually exceeding 0.6 mm). Dry culms, 10 mm below inflorescence, 1.5–3.5 mm in diameter, but usually some, more often the majority, exceeding 2 mm 7

7a Ligule of uppermost leaf sheath 1.0–1.8 mm. Glumes 1.9–2.6 mm (usually uniform above the basal smaller ones); apiculum well marked, but not long-attenuate). Anther and crest 0.4–0.7 mm long. Style usually shorter than 0.8 mm, branches not longer than 1.5 mm .... 8. *S. muricinux s.s.*
7b Ligule of uppermost leaf sheath 0.5–0.8 mm. Glumes 2.4–3.4 mm (often irregularly sized above basal smaller ones; apiculum often long-attenuate). Anther and crest 0.9–1.3 mm long. Style length usually longer than 0.8 mm, branches often longer than 1.5 mm (Maputaland) .... 2. *S. confusus*

8a Achenes golden to brownish, transversely ridged across the faces, but with smooth margins. Culm-like inflorescence bract, often with transverse septa (especially evident in the dry state) .... 12. *S. senegalensis*
8b Achenes brown becoming black at maturity, markedly transversely ridged across both faces and margins. Inflorescence bract always lacking transverse septa 9

9a Glumes 3–4 mm long. Connective to anthers distinctly bristly. Styles within a spikelet predominantly 2-branched. Achenes predominantly biconvex, 0.9–1.3(–1.5) mm long .... 5. *S erectus*
9b Glumes 1.8–2.5 mm long. Connective to anthers smooth or with few bristles. Styles within a spikelet predominantly 3-branched. Achenes predominantly trigonous, 1.0–1.3 mm long .... 6. *S. lateriflorus*

10a Culms and inflorescence bracts with septa (clearly defined in the dry state). Glumes white to greenish or brownish in life, pallid and membranous when dry (Maputaland only) .... 1. *S. articulatus*
10b Culms and inflorescence bracts without septa. Glumes usually dark brown and papery; if pallid then with some dark brown markings 11

11a Glumes about 1.5 mm long, submuticous. Achenes 0.7–0.9 mm long with 3 or 2 minute basal outgrowths (rudimentary bristles). (N Natal only) .... 11. *S. pulchellus*
11b Glumes longer than 2.0 mm (sometimes exceeding 4.0 mm), mucronate. Achene longer than 1.0 mm, usually without any evidence of hypogynous bristles, although rudiments may sometimes occur 12

12a Glumes fairly uniformly dark brown. Robust plants (often in water) with culms 5–8 mm in diameter at half-length. Inflorescence a branched anthela (widespread) .... 3. *S. corymbosus*
12b Glumes with pallid body and dark brown inverted V towards apex. Slender plants (not always in water) with culms seldom exceeding 2.0 mm at half-length. Inflorescence a head (usually unbranched, but evidence of reduced branching sometimes detectable) (southern Natal; possibly southern Drakensberg) .... 4. *S. decipiens*

1. **Schoenoplectus articulatus** *(L.) Palla*, Botanische Jahrbücher 10: 299 (1889); J. Raynal: 146 (1976c); K.L. Wilson: 159 (1981); R.W. Haines & Lye : 58 (1983). Type: from Malabariae, herb. Linné 71.4 (LINN, holo.). Figure 66A, D.

Scirpus articulatus L.: 47 (1753). *Isolepis articulata* (L.) Nees: 108 (1834a).

Icones: C.B. Clarke: t. 49, figs 1, 2 (1909); R.W. Haines & Lye: fig. 73 (1983); T. Koyama: fig. 7 (1985); Vanden Berghen: fig. 257 (1988).

Vouchers: *Pooley 1623; Tinley 615; C.J. Ward 2578.*

Description: R.W. Haines & Lye: 58 (1983).

Distribution: Maputaland.

Tufted annuals (perhaps persisting longer when habitat conditions permit ?); locally common in water of seasonal pools, usually where there is an organically enriched, sandy substrate. Leaves reduced to loose sheaths; culms photosynthetic, terete, marked by transverse septa when dry. Inflorescences of globose heads of white to pale green, brown-tinged spikelets each overtopped by a bract longer than culm. Glumes 3–5 mm long, ovate-triangular, firm, slightly concave. Smooth-surfaced black achenes lack a perianth. The species seems to grade into slender examples in which glumes are golden to bronze-brown, with achene surfaces transversely ridged, but margins smooth (*Schoenoplectus senegalensis* No. 12). These 'intermediates', if that is what they are, have sometimes been named *Scirpus praelongatus* Poir., but the status of this species is unclear. Raynal (1976c) accepts it in its own right under *Schoenoplectus* but says it is absent from Africa. Haines & Lye (1983) regard it as a synonym of *Schoenoplectus senegalensis*. Kern (1974) is of the opinion that *Scirpus articulatus, S. praelongatus*, and *S. senegalensis* do not deserve individual specific ranking.

2. ***Schoenoplectus confusus** *(N.E. Br.) Lye* in Botaniske Notiser 124 (2): 290 (1971c); R.W. Haines & Lye: 57 (1983). Type: Ethiopia, Amogai, *Schimper 253* (K). Figure 66B, E.

Scirpus confusus N.E. Br.: 300 (1921).

This is a tropical African species. Plants tufted, leafless perennials emergent from water of seasonal pools and wallows, or occasionally drainage ditches. In general facies resemble plants of *S. corymbosus*, but distinguished by their smaller size, dark-brown, inverted V-shaped markings on glumes, and markedly transversely ridged, dark brown to black achenes.

In tropical Africa there are two phases of the species, namely:

var. *confusus*

Typical phase, perianth segments lacking from florets.

Description: N.E. Br.: 300 (1921) as *Scirpus confusus.*

Icones: R.W. Haines & Lye: figs 71, 72 (1983).

var. *rogersii* (N.E. Br.) Lye: 242 (1983c); R.W. Haines & Lye: 57 (1983). Type: Rhodesia (Zimbabwe), Matopos, *Rogers 7914* (K).

Scirpus rogersii N.E. Br.: 301 (1921).

Frequent in Zimbabwe and occasionally sympatric with var. *confusus* throughout its distributional area; perianth bristles well developed.

Description: N.E. Br.: 301 (1921) as *Scirpus rogersii.*

A previous list of Natal Cyperaceae (Gordon-Gray in Ross 1972) included *Scirpus confusus* (*Ward 2573, 4161*). Subsequent investigation has shown these numbers to be more accurately placed within the *Schoenoplectus erectus* (Poir.) J. Raynal/*S. lateriflorus* (J.F. Gmel.) Lye complex. Therefore, up to now there has been no accurate record of *Schoenoplectus confusus* south of Zimbabwe. The species is not listed by Reid in Gibbs Russell *et al.* (1985). However, Browning, in the course of revisionary studies, found plants from Maputaland to be very close to typical *S. confusus*. There are minor differences from the type that will be summarised below. The significance of this variation is difficult to assess because of few typical specimens available for study. It may be too slight to be meaningful. In the present work the Natal plants are segregated from var. *confusus* mainly because of the distributional hiatus that appears to exist between them and known records of var. *confusus* further north. It is possible there might be connection by way of the Mozambique plain, but the Mozambican flora is poorly known.

Distribution: Maputaland.

Vouchers: *Goodman 1237; Pooley 1263; Taylor 23* (NH); *Tinley 624, 863; Van Wyk 680; C.J. Ward 1969, 4568, 10071.*

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* See addendum.

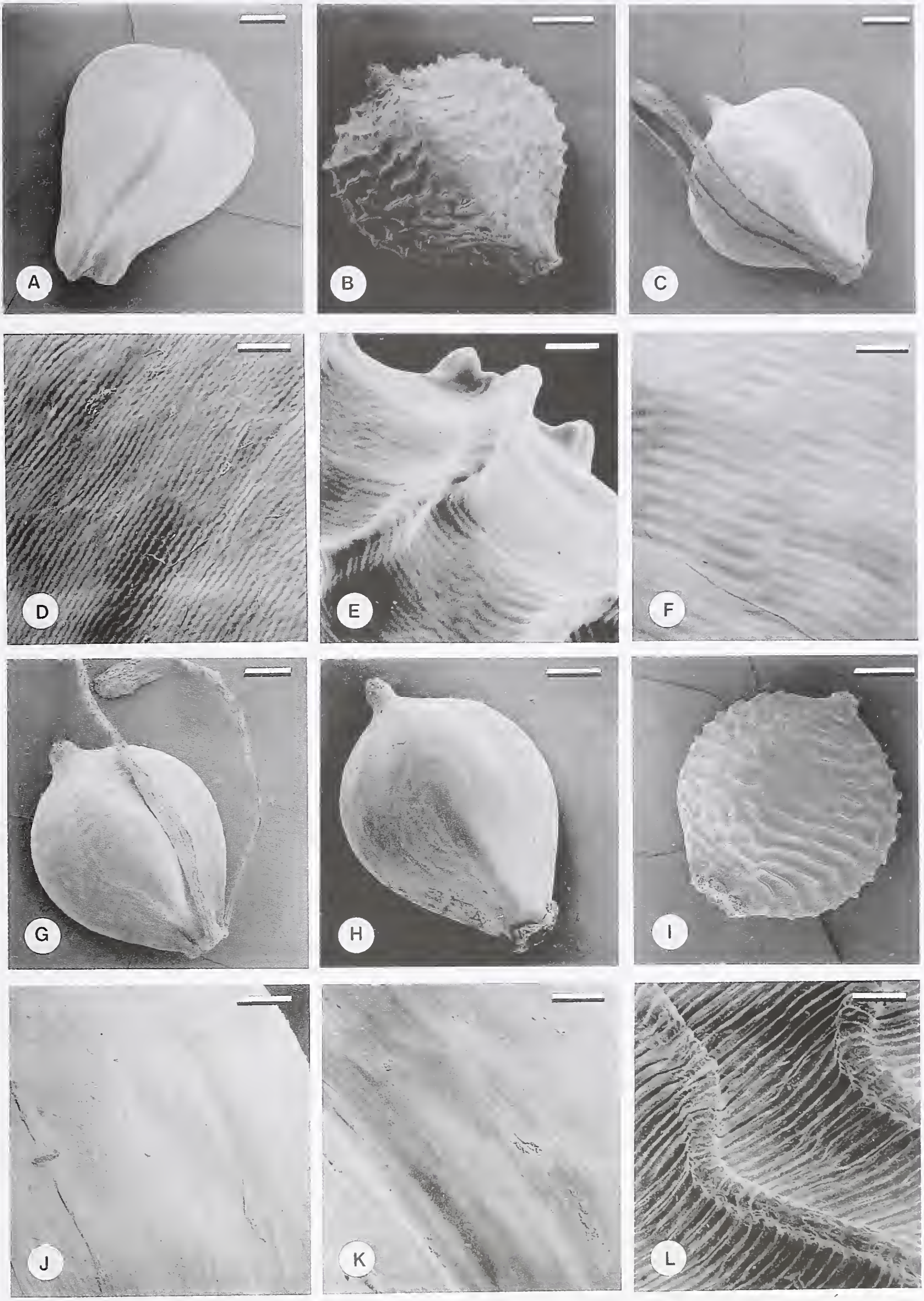

FIGURE 66.—*Schoenoplectus*. A, D, *S. articulatus*, *Gillissen s.n.*; B, E, *S. confusus*, *Goodman 1237*; C, F, *S. corymbosus* var. *brachyceras*, *Taylor 85*; G, J, *S. corymbosus* var. *corymbosus*, *J. Browning 258*; H, K, *S. decipiens*, *Getliffe 1225*; I, L, *S. erectus* subsp. *raynalii*, *Ward 3264*. Scale bars: A–C, G–I, 250 µm; D–F, J–L, 25 µm.

Plants grow in seasonal pans and vleis, rooted in water that may be up to 0.5 m deep. Less commonly they occupy hygrophilous grassland. Differ from typical *S. confusus* in the more markedly digitate, radiating arrangement of sessile spikelets of rayed heads of anthelate inflorescence; in the minute spicate projections of anther crest and softer culms (readily compressible by light pressure of fingers). A more exhaustive study of *S. confusus* in Africa may show whether the Natal plants require infraspecific status under that species.

Relationship of *S. confusus* var. *confusus* (including Natal plants) is with *S. muricinux s.s.* (No. 8) in detail of transverse ridging of achene, and with *S. corymbosus* (No. 3) in general plant facies, inflorescences and minutae of glumes, anthers, styles and style branches.

3. **Schoenoplectus corymbosus** *(Roth ex Roem. & Schult.) J. Raynal* in Peyre de Fabregues & Lebrun, Catalogue des Plantes Vasculaires du Niger, Étude Botanique 3: 343 (1976a); J. Raynal: 538 (1976b); Lye: 242 (1983c); R.W. Haines & Lye: 56 (1983); P.L. Forbes: 62 (1987b); Hilliard: 58 (1987); Hilliard & B.L. Burtt: 115 (1987); J. Browning: 335 (1991b). Type: from India: communicated to Roth by B. Heyne (not located).

Isolepis corymbosa Roth ex Roem. & Schult.: 110 (1817) non C. Presl (1828). *Scirpus corymbosus* (Roth ex Roem. & Schult.) B. Heyne ex Roth: 28 (1821), nom. illeg., non L. (1756); Boeck.: 706 (1869/70); C.B. Clarke: 657 (1894b); C.B. Clarke: 229 (1897/98); C.B. Clarke: 455 (1901/02); Kük.: 74 (1934); Cherm.: 154 (1936/37).

I. inclinata Delile: 50 (1813) nom. nud. *Scirpus inclinatus* (Delile ex Barbey) Asch.. & Schweinf. ex Boiss.: 381 (1882); Robyns & Tournay: 270 (1955); Podlech: 49 (1967). *Schoenoplectus inclinatus* (Delile) Lye: 290 (1971c).

Scirpus brachyceras Hochst. ex A. Rich.: 496 (1851); Hooper in Hooper & Napper: 311 (1972). *Schoenoplectus brachyceras* (A. Rich.) Lye: 290 (1971c). Type: Abyssinia (Ethiopia), in rivis et paludibus prope Adoam, *Schimper 288* (K, holo.).

S. corymbosus is probably the best known of the Natal species of the genus. There has been uncertainty regarding the correct name. Under *Scirpus*, the combination *S. corymbosus* is invalid, so until transfer to *Schoenoplectus*, the name applied most frequently was *Scirpus inclinatus*. The confusion was exacerbated by early realisation of two elements within the species, the one based on a type from India, the other on *Schimper 288* from Ethiopia. Prior to publication of the work by Haines & Lye (1983) on tropical African plants, there was a tendency to accept that only plants relating to the Ethiopian type were represented in southern Africa. Recent revisionary study by Browning (1991b) has provided clarification that both elements are present in southern Africa and Natal. Haines & Lye (1983) distinguished these elements at varietal level in tropical Africa and this has been followed by Browning. *Schoenoplectus corymbosus* probably forms part of the 'papkuil' eaten by hippopotami and culms are sometimes used in weaving. Note: in dealing with the synonymy, it has not been possible to determine which synonyms were applied exclusively to which element of the species (often there was no differentiation) and so all names have been given under the species.

*Key to varieties

1a Mature spikelet apex rounded, outline fairly smooth. Glume terminating in a mucro 0.1–0.2 mm long. Anther crests 0.2–0.3 mm long, lacking marginal spine-like projections (if present few and confined to apex). Overtopping bract rounded, stem-like, 20–100 mm long. Achene length 1.3–2.0 mm .... var. *corymbosus*
1b Mature spikelet apex bristly, outline irregular. Glume terminating in a mucro 0.25–0.55 mm long. Anther crests 0.4–0.5 mm with pronounced marginal spine-like projections. Overtopping bract not rounded and stem-like, 15–35 mm (occasionally longer). Achene length 1.3–1.5 mm .... var. *brachyceras*

var. **corymbosus** (Figure 66G, J)

Description: R.W. Haines & Lye: 56 (1983).

Distribution: Midlands, Uplands.

Vouchers: *J. Browning 258, 338; Edwards 2411.*

Infrequently collected in Natal. May have been introduced, which may account for scattered distribution. Shows preference for dams, rather than for streams, where it extends into water up to 1 m deep.

var. **brachyceras** *(A. Rich.) Lye* in Nordic Journal of Botany, 3: 242 (1983c); R.W. Haines & Lye: 56 (1983); J. Browning: 339 (1991b). Type: Abyssinia (Ethiopia), *Schimper 288* (K, holo.). Figure 66C, F.

Icones: R.W. Haines & Lye: fig. 70 (1983).

Vouchers: *K.D. Huntley 445; Musil 189* (PRE); *Strey 4366* (PRE); *Taylor 85.*

Description: J. Browning: 339 (1991b).

Distribution: Coast, Midlands, Uplands, southern Natal (Mount Currie).

Commonly found in marginal situations in dams and rivers in Natal. In comparison with the typical phase there is perhaps a preference for cooler waters at higher altitudes. Plants from mountainous areas of northern Natal (Wakkerstroom Dist.) appear to have extremely dark glumes in comparison with those from other localities at similar altitudes.

4. **Schoenoplectus decipiens** *(Nees) J. Raynal* in Adansonia, Sér. 2, 15: 540 (1976b); P.L. Forbes: 61 (1987b); Hilliard: 58 (1987); Hilliard & B.L. Burtt: 115 (1987); J. Browning: 27 (1990). Type: S Africa, Zwellendam (Swellendam), between Kochmannskloof (Boschmanskloof) and Gaurit River, *Ecklon & Zeyher s.n.* [K, lecto. designated J. Browning (1990); P, isolecto.]. Figure 66H, K.

Isolepis decipiens Nees: 291 (1834b); Nees 157 (1835).

I. paludicola Kunth: 198 (1837). *Scirpus paludicola* Kunth var. *decipiens* (Nees) C.B. Clarke: 629 (1894b). Type: S Africa, without locality, *Drège 3959a* (P, iso.).

Scirpus paludicola auct., non Kunth; Boeck.: 703 (1869/70); C.B. Clarke: 230 (1897/98) p.p.; Schönland: 39 (1922) p.p.

Icones: J. Browning: figs 2, 3, 6, 9 (1990).

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* See addendum.

Vouchers: southern Natal, Franklin, alt. 1 500–1 520 m: *Getliffe 1225; Taylor 15, 37.* Lesotho, Sehlabathebe, alt. 2 325–2 350 m: *Hoener 1614, 2035.*

Description: J. Browning: 27 (1990).

Not yet known from Upland Natal, but should be looked for there because of its presence in Lesotho. Plants perennial with rhizome, either with elongate internodes, or with shoots juxtaposed so that culms tufted: both possibilities may be present in a single plant. Favoured habitats are vleis, margins of pools and in seepages, plants usually emergent from water. There is similarity in general facies with *S. paludicola* (No. 10), which is generally confined to altitudes from sea level to 1 350 m. Distinction is by characters given in key. Detailed features of *S. decipiens* (glumes, anthers, achenes) suggest relationship with *S. corymbosus* (No. 3), but plants much less robust.

5. **Schoenoplectus erectus** *(Poir.) Palla ex J. Raynal* in Adansonia 16: 141 (1976c); K.L. Wilson: 160 (1981). Type: Maurice, (Mauritius) *Du Petit-Thouars 13* (P, holo., iso.).

Scirpus erectus Poir.: 761 (1804).

Isolepis uninodis Delile: 152 (1814). *Scirpus uninodis* (Delile) Coss. & Durieu: 310 (1867). *Scirpus supinus* L. var. *uninodis* (Delile) Asch. & Schweinf.: 157 (1887); C.B. Clarke: 453 (1901/02) p.p. Type: *Delile* (MPU, holo.; P, iso.).

subsp. *erectus*

In Madagascar and associated islands. Uncertainly known from African continent.

subsp. **raynalii** *(Schuyler) Lye* in Nordic Journal of Botany 3: 243 (1983c); R.W. Haines & Lye: 62 (1983). Type: southern Africa, Botswana (Bechuanaland), *Yalala 425* (P, holo.). Figure 66I, L.

Scirpus raynalii Schuyler: 438 (1971a).

Icones: R.W. Haines & Lye: figs 82, 83 (1983).

Vouchers: *I'Ons 120/82; C.J. Ward 2783, 3260, 3264, 4025, 9531.*

Description: R.W. Haines & Lye: 62 (1983).

Distribution: Coast, Maputaland.

In Ross (1972), *C.J. Ward 2783, 4025* were cited under *Scirpus supinus* L. This species, now transferred to *Schoenoplectus* as *S. supinus* (L.) Palla, is closely allied to *S. erectus* and *S. lateriflorus* (No. 6). It seems simplest to discuss these taxa collectively.

S. supinus is now regarded as Eurasian in distribution (southern Europe, the type from France; northern Africa; western Asia) and is distinguishable from the other two by culms that lack nodes above the plant base; capitate inflorescences each with a solitary bract; achenes 1.3–1.5 mm long and no realisation of amphicarpy.

S. lateriflorus is very close to *S. supinus.* Differences are: 1–2 nodes above plant base; relatively smaller achenes 1.0–1.3 mm long with less well-marked transverse ridges; a capacity for amphicarpy. Both have 3-cleft styles and trigonous achenes.

S. erectus has often been confused with *S. lateriflorus*, but Kern (1974) pointed out the distinctive features. The former is characterised by longer glumes (3–4 mm, as against 1.8–2.5 mm in *S. lateriflorus*); more distinctly bristly connective of anthers; 2-cleft style and biconvex achenes, 0.9–1.3(–1.5) mm long against those of *S. lateriflorus*, 1.0–1.3 mm long. *S. erectus* is also sometimes amphicarpous.

Infraspecific categories have been recognized within all three taxa. For Ceylon, Koyama recorded *Schoenoplectus supinus* (L.) Palla subsp. *lateriflorus* (J.F. Gmel.) T. Koyama. Other authors maintain *Schoenoplectus lateriflorus* (J.F. Gmel.) Lye at specific level (Wilson 1981 for Australia; Haines & Lye 1983 for East Africa). The latter pair report within it, the typical subspecies and subsp. *laevinux* Lye (with 2-branched style and less markedly ridged achene). Within *S. erectus* they recognise the typical subspecies and subsp. *raynalii*, the latter with very prominent ridges to the achene.

To summarise, it must be concluded there is variability within each of *S. supinus, S. lateriflorus* and *S. erectus* and that the three taxa are intimately linked. In consequence, it is not surprising to find non-clarity in attempting to treat the Natal plants systematically.

In Natal plants referable to *S. erectus* subsp. *raynalii* are definitely present: characterised by predominantly 2-cleft styles and biconvex achenes of aerial florets (achenes with pronounced transverse ridges that project strongly over achene shoulders). When amphicarpy occurs, basal styles consistently 3-cleft; basal achenes larger than the aerial and more or less trigonous.

These plants are sympatric (in the same general locality, if not always in precisely the same local population) with others referable to *S. lateriflorus* subsp. *lateriflorus* with 1–2 nodes to culm above plant base, 3 style branches and trigonous achenes to aerial florets. When amphicarpy occurs, basal styles always 3-branched; basal achenes larger than the aerial and more or less trigonous.

There are also plants with both 2-cleft and 3-cleft styles within an individual spikelet. It becomes obvious that style branching and number of angles to the achene are inadequate in identification, and emphasis must be placed on glume size and anther structure (both only tentatively reliable characters; fully mature examples should be compared).

There is therefore an element of chance in the names applied, and it is not altogether surprising if a single collection is found to cover the requirements of both species.

Plants of both *S. erectus* and *S. lateriflorus* slender, usually sparsely leafy annuals with lateral inflorescences (either branching anthelas or compact heads) with an overtopping bract usually longer than culm, growing in sandy alluvium along pool and vlei margins, sometimes among short grasses. Glumes with ciliate margins (cilia not always easy to detect nor always developed!). Perianth is unknown for aerial florets but two bristles accompany each basal amphicarpous achene (Browning 1992a).

Also present in Natal are specimens that do not fit conformably with either *S. lateriflorus* or *S. erectus*. *Ward 2573* is an example. In Ross (1972), this number was incorrectly cited under *Schoenoplectus confusus* N.E. Br. It fits more acceptably with *Schoenoplectus microglumis* Lye, another closely related taxon, up to now unrecorded for southern Africa, which on size dimensions (glumes 1.3–1.6 mm long, lacking a ciliate margin; plants smaller) is segregated from *S. lateriflorus*.

A comprehensive field study of southern African populations is required to record variation and to consider whether, or not, the Natal plants with 2-cleft and 3-cleft styles within an individual aerial spikelet may have arisen by hybridisation. It seems more likely that all plants retain an ability to develop 3-cleft styles.

6. **Schoenoplectus lateriflorus** *(J.F. Gmel.) Lye* in Botaniska Notiser 124: 290 (1971c); J. Raynal: 139 (1976c); K.L. Wilson: 160 (1981); R.W. Haines & Lye: 62 (1983). Type: Sri Lanka, *Koenig s.n.* (LD) (under *Scirpus lateralis* Retz. which is a later homonym of *S. lateralis* Forssk., a nom. confus. of which the type was lost). Figure 67A, D.

Scirpus lateralis Retz.: 12 (1786/87) non Forssk. (1775).

S. lateriflorus J.F. Gmel.: 127 (1791). *S. supinus* L. var. *lateriflorus* (J.F. Gmel.) T. Koyama: 302 (1958).

S. supinus auct. non L.: Boeck.: 699 (1869/70) p.p.; C.B. Clarke: 452 (1901/02).

Icones: R.W. Haines & Lye: figs 84, 85 (1983).

Vouchers: *C.J. Ward 4161* (PRE), *7691*, *8883*.

Description: R.W. Haines & Lye: 62 (1983).

Distribution: Maputaland.

See *Schoenoplectus erectus* (No. 5).

7. ***Schoenoplectus litoralis** (*littoralis*) *(Schrad.) Palla* Verhandlungen der kaiserlich-königlichen zoologisch-botanischen Gesellschaft in Wien 38, Sitzungsberichte: 49 (1888); Palla: 299 (1889); K.L. Wilson: 160 (1981); T. Koyama: 157 (1985). Figure 67B, E.

Scirpus litoralis Schrad.: 142 (1806); C.B. Clarke: 231 (1897/98); C.B. Clarke: 456 (1901/02); Podlech: 46 (1967).

S. subulatus Vahl: 268 (1805); Kunth: 165 (1837); Boeck.: 715 (1869/70); Ridl.: 158 (1884). *Schoenoplectus subulatus* (Vahl) Lye: 290 (1971c); R.W. Haines & Lye: 54 (1983). Type: from Nicobar Islands.

Scirpus pterolepis Kunth: 167 (1837). *S. litoralis* Schrad. var. *pterolepis* (Kunth) C.B. Clarke: 625 (1894b).

Icones: R.W. Haines & Lye: figs 65, 66 (1983) as *S. subulatus*. Vanden Berghen: figs 262, 266 (1988).

Vouchers: *C.J. Ward 4215*, *4226*.

Description: R.W. Haines & Lye: 54 (1983) as *Schoenoplectus subulatus*.

Distribution: Coast, Maputaland.

Note: two elements are recognised within this species. In the Mediterranean region, SW Asia and China, plants have triquetrous culms; in Africa, India, Malesia, Micronesia and Australia, culms terete, but trigonous just below inflorescence. Authorities (Koyama 1958; Townsend 1962; Kern 1974) accept culm shape as the most significant distinguishing character. There is, however, no consensus on the classificatory ranking to be adopted. Some workers recognise the African-Australian entity as a discrete species (*Schoenoplectus subulatus* (Vahl) Lye; Haines & Lye 1983); others give it subspecific status (*S. litoralis* subsp. *subulatus* (Vahl) T. Koyama (Koyama 1985); yet others are unprepared to form opinion, being ignorant of the total range of variability (Wilson 1981). In the present work this last alternative is followed.

For Africa, there has also been a tendency to differentiate between the Angolan and Namibian plants (western entity) and those from Zambesia, Natal and the eastern Cape (eastern entity). The eastern entity (*Scirpus pterolepis* Kunth, or *S. litoralis* var. *pterolepis* C.B. Clarke) is said to have a more copiously branched inflorescence and longer, oblong spikelets. However, such differences have not been much accepted and are not recognised here, pending further study.

Natal plants fairly robust, tall, leafless rhizomatous perennials emergent from water up to 1–2 m deep in lakes and pools. Anthelate, lateral, usually quite extensively branching inflorescence has some solitary pedunculate spikelets with ciliate-margined glumes. Anther connectives fan-shaped and provided with numerous minute spine-like outgrowths. Style branches are 2 only. Main diagnostic criterion for species is perianth composed of 4–5(–6) markedly plumose segments termed 'bristles', but often wider than retrorse bristles of species such as *Schoenoplectus paludicola* (No. 10).

In general facies, plants show relationship with *S. corymbosus* (No.3), but the inflorescence in this last-named species has spikelets aggregated digitately and mostly lacking peduncles. Relationship with *Schoenoplectus lacustris* L. is possibly closer (ciliate-margined glumes, presence of a perianth, 2-branched styles and achenes smooth, yellowish eventually becoming brown), but *S. lacustris* is nowhere really frequent in southern Africa, except perhaps the Witwatersrand area (Forbes 1987b), and is not known from Natal.

Plants of *S. litoralis* are often described as 'leaves 0', meaning reduced to sheaths, but some plants produce well-developed under-water blades (up to 300 × 10 mm) (for example *Ward 9629* from Lake Sibayi).

8. **Schoenoplectus muricinux** *(C.B. Clarke) J. Raynal* in Adansonia, Sér. 2, 15: 538 (1976b); R.W. Haines & Lye: 57 (1983); J. Browning: 249 (1991a). Type: Rhodesia (Zimbabwe), Matopos, Bulawayo, *Eyles 1202* (K, lecto, designated by J. Browning (1991a); SRGH, isolecto.). Figure 67C, F.

Scirpus muricinux C.B. Clarke: 135 (1906b).

Icones: J. Browning: figs 1, 4a, 5 (1991a). .

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* See addendum.

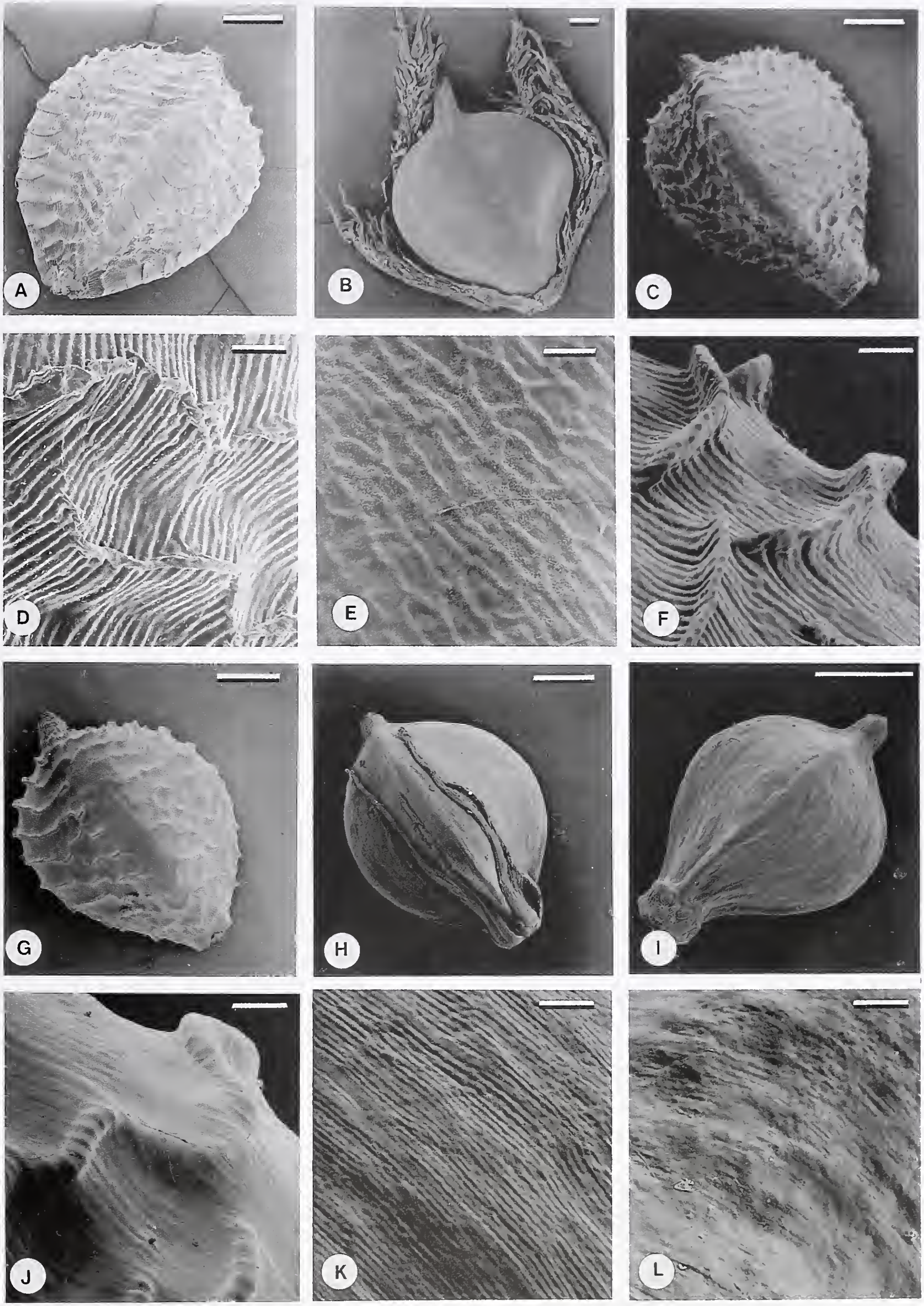

FIGURE 67.—*Schoenoplectus*. A, D, *S. lateriflorus, Ward 7315*; B, E, *S. litoralis, J. Browning 221*; C, F, *S. muricinux, Hilliard & B.L. Burtt 14470*; G, J, *S. muriculatus, King 378*; H, K, *S. paludicola, J. Browning 147*; I, L, *S. pulchellus, Dieterlen 1335* (SAM). Scale bars: A–C, G–I, 250 µm; D–F, J–L, 25 µm.

Vouchers: *Goetghebeur 4384* (PRE), *Hilliard & B.L. Burtt 14470*.

Description: J. Browning: 251 (1991a).

Distribution: N Natal, Maputaland.

The name *S. muricinux* has been applied somewhat indiscriminately to perennial plants resembling *S. corymbosus* (No. 3), but with an achene that is transversely ridged. Observation of the achene has often been sufficient for identification without further scrutiny. This has resulted in more than a single entity being incorporated. The recent study of southern African specimens by Browning (1991a) has revealed the need for segregation of *S. muricinux sensu stricto*, from *S. muriculatus* (Kük.) J. Browning and of plants from Maputaland that have been placed with *S. confusus*. The key to species should be consulted and carefully adhered to in undertaking identification.

S. muricinux s.s. is rare in Natal. Plants grow in wet areas where they are emergents from vleis or riverine backwaters. Distribution pattern in southern Africa [J. Browning: fig. 8 (1991a)] indicates the species has preference for drier, hot areas of Namibia, Botswana and Transvaal, often in black clay soils. Perianth lacking.

9. **Schoenoplectus muriculatus** *(Kük.) J. Browning* in South African Journal of Botany 57: 254 (1991a). Type: Rhodesia (Zimbabwe), Victoria, Ndanga in campo graminoso prope rivum Mitilinwe (Mtilikwe), *Fries, Nordlindh & Weimark 2137* (LD, holo.). Figure 67G, J.

Scirpus muriculatus Kük.: 75 (1934).

Icones: Kük.: fig. 1 (1934); J. Browning: figs 2, 4b, 6 (1991a).

Vouchers: *Goetghebeur 4330* (PRE); *King 378; Taylor 61*.

Description: Kük.: 75 (1934); J. Browning: 255 (1991a).

Distribution: Midlands, N Natal, southern Natal (Mt Currie).

Plants of *S. muriculatus* more slender than those of *S. muricinux s.s.*, with darker spikelets. Former species more closely resembles *S. paludicola* (No. 10) in general facies, but no perianth present and achenes markedly transversely ridged (5–6 bristles and smooth achenes in *S. paludicola*). In southern Natal *S. muriculatus* and *S. paludicola* are sympatric, but in other parts of Natal, the latter (usually the more frequent) tends to occupy lowland situations (up to 1 350 m) whereas *S. muriculatus* prefers altitudes from 1 000–2 000 m (upper limit somewhat uncertain). Relationships are very close and all specimens require careful investigation if naming is to be accurate.

10. **Schoenoplectus paludicola** *(Kunth) Palla ex J. Raynal* in Adansonia, Sér. 2, 15: 541 (1976b); J. Browning: 26 (1990). Type: South Africa, between Key (Kei) and Gekau, *Drège 4426* (K, P, iso.). Figures 67H, K; 68.

Scirpus paludicola Kunth: 163 (1837); Boeck.: 703 (1869/70); C.B. Clarke: 230 (1897/98) p.p.; Schönland: 39 (1922) p.p.

Icones: Schönland: t. 39 (1922); J. Browning: figs 1, 5, 8 (1990).

Vouchers: *Acocks 422* (PRE); *K.D. Huntley 509; Killick 618; Moll 1187* (PRE), *2285; Taylor 60; C.J. Ward 1464, 3817*.

Description: J. Browning: 26 (1990).

Distribution: widespread (except northern coastal Maputaland and high altitude Upland localities).

Frequent throughout Natal, except in extreme zones mentioned above. Densely tufted, leafless perennial plants grow usually in water fringing temporary pools in grassland, or along vlei and streamlet margins, and reach about 0.5 m in height. Lateral, head-like inflorescence of dark brown spikelets overtopped by a green bract that continues line of stem, is easily recognisable. Attention to details given in key are necessary for precise identification, but the smooth, black achenes accompanied by five (or 6) retrorsely scabrid bristles are excellent guiding characteristics. Closest relative is *S. muriculatus* (No. 9) which, however, lacks bristles and has a transversely ridged achene. Confusion is possible with *S. muricinux* (No. 8) and with plants from Maputaland that are placed under *S. confusus* (No. 2). Both of these entities however, have transversely ridged achenes. There is also the possibility of confusion with *S. decipiens* (No. 4) which has longer glumes and anthers, and smooth to faintly rugulose achenes.

11. **Schoenoplectus pulchellus** *(Kunth) J. Raynal* in Adansonia, Sér. 2, 15: 542 (1976b); P.L. Forbes: 63 (1987b); J. Browning: 27 (1990). Type: S Africa, Cape, Grahamstown Div., Fish River, *Drège 4427* (K, P, iso.). Figure 67I, L.

Ficinia pulchella Kunth: 261 (1837). *Scirpus pulchellus* (Kunth) Boeck.: 698 (1869/70).

Scirpus paludicola auct. non Kunth: C.B. Clarke: 230 (1897/98) p.p.

Icones: J. Browning: figs 4, 7, 10 (1990).

Voucher: *Youthed G124* (CPF).

Description: J. Browning: 28 (1990).

Distribution: N Natal (Vryheid area only).

Plants slender and dainty compared with their closest relatives, *S. paludicola* (No. 10) and *S. decipiens* (No. 4). Confusion with less well-grown examples of *S. muriculatus* (No. 9) is a possibility, but this species has transversely ridged achenes. Small achenes (under 1.0 mm long, smooth-surfaced and with 3 or 2 rudimentary bristles) provide criteria by which *S. pulchellus* is most readily identified. Its sporadic distribution and its reduced perianth, are suggestive of an origin for the taxon by way of hybridisation and subsequent stabilisation, but this remains purely speculative. Plants should be looked for in other areas of N Natal.

12. **Schoenoplectus senegalensis** *(Hochst. ex Steud.) Palla ex J. Raynal*, in Peyre de Fabregues & Lebrun, Catalogue des Plantes Vasculaires du Niger. Étude Botanique 3: 344 (1976a); J. Raynal: 149 (1976c); R.W. Haines & Lye: 58 (1983); P.L. Forbes: 62 (1987b). Type: Ethiopia, *Schimper 1194* (P, holo.; K, BM, iso.). Figure 69.

Isolepis senegalensis Hochst. ex Steud.: 96 (1855), non *Scirpus senegalensis* Lam.

Scirpus jacobi C.E.C. Fisch.: 103 (1931b). Type: *Heyne in Wallich 3458* (K, BM). *Schoenoplectus jacobi* (C.E.C. Fisch.) Lye: 290 (1971c).

Scirpus articulatus auct. non L.: C.B. Clarke: 228 (1897/98); C.B. Clarke: 453 (1901/02) p.p.

Icones: R.W. Haines & Lye: figs 74, 75 (1983); Vanden Berghen: fig. 265 (1988).

Voucher: *C.J. Ward 3135*.

Description: R.W. Haines & Lye: 58 (1983).

Distribution: Maputaland.

Plants tufted, glabrous annuals with general facies of *S. articulatus* (No. 1), but much more slender and very variable both in robustness (height does not vary as greatly) and in development, or not, of transverse septa in culms and inflorescence bracts (septa best seen when tis-

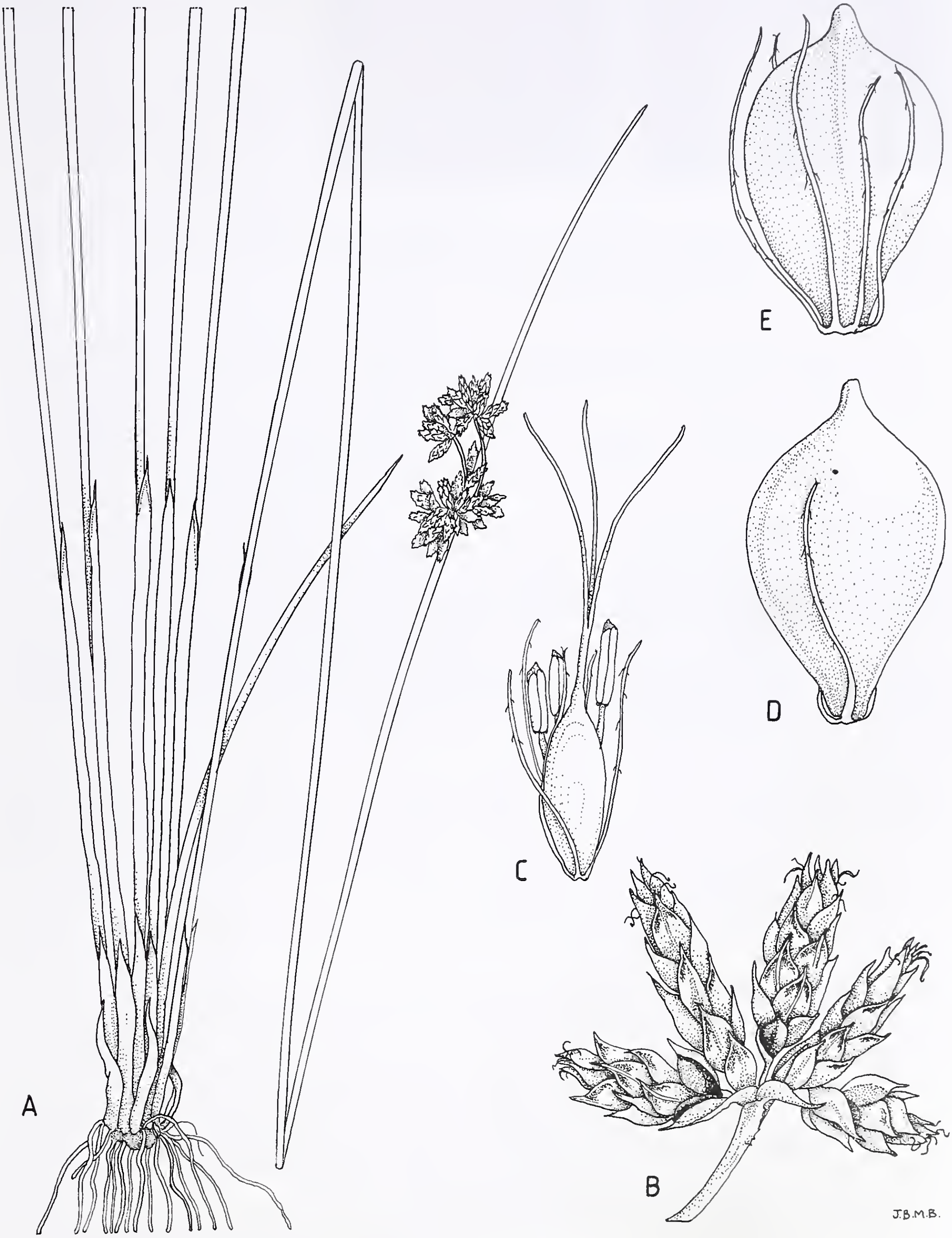

FIGURE 68.—*Schoenoplectus paludicola, K.D. Gordon-Gray 27/66 G.* A, plant, × 1; B, spikelets bearing mature achenes, × 6; C, young floret, × 38; D, achene, adaxial surface, × 38; E, achene, abaxial surface, × 38.

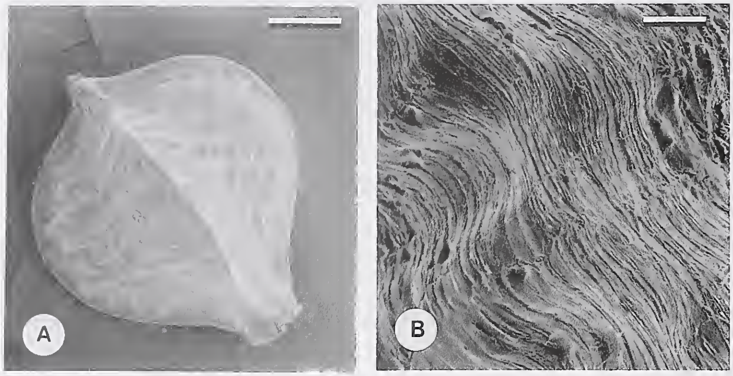

FIGURE 69.—*Schoenoplectus senegalensis, Letley s.n.* Scale bars: A, 250 μm; B, 25 μm.

sues have dried). Glumes (up to 3.2 mm long) softer, more concave, pale to deep golden yellow and closely convolute in spikelets compared with those of *S. articulatus* (3–5 mm long, white to green or brown-tinged, firm in texture, not as markedly convolute in spikelets).

Limits between *S. senegalensis* and *S. articulatus* are not clearly defined. A comprehensive field study in Maputaland may yield useful information.

0521000 SCHOENOXIPHIUM

Schoenoxiphium *Nees* in Linnaea 7: 531 (1832); C.B. Clarke: 297 (1897/98); Kük.: 28 (1909); Schönland: 66 (1922); R.W. Haines & Lye: 366 (1983). Type: *S. capense* Nees, nom. illeg. Earlier named *Schoenus lancens* (Thunb. 1794). Combination under *Schoenoxiphium, S. lancens* Kük.: 28 (1909).

Note: *Schoenoxiphium* is under revision by I. Kukkonen, Helsinki. The treatment that follows is based upon this author's preliminary studies, (Kukkonen 1978, 1983, 1986) and is intended as a tentative aid to identification of species in Natal where the genus is well represented in the Uplands.

Readers unfamiliar with the floral organisation in *Schoenoxiphium* are referred to Levyns (1945) and Kukkonen (1983). The genus shows evidence of reduction both in the inflorescence (from large panicle with branches from successive stem nodes to single spike) and in the number of branching axes incorporated into the 'spikelets'. The structure of these 'spikelets' (florets are essentially unisexual) is briefly explained in Figure 70. The species of *Schoenoxiphium* in Natal show different expressions of these reductional levels. Usually the range within a species is limited, resulting in each entity having a recognisable morphological facies. From species to species, however, differences are considerable and this (because of condensation and the disappearance of structures) may make for difficulties of interpretation during identification. The reduction in *Schoenoxiphium* culminates in the genus *Carex*. By this statement direct evolution of the one genus from the other is not necessarily implied.

Key to species

Note: in using this key, if leaf width is open to doubt, both alternatives under 1 should be attempted.

1a Robust rhizomatous perennials with majority of leaf blades 4–12 mm wide 2
1b Medium to slender rhizomatous or tufted perennials with majority of leaf blades not wider than 4 mm 9

2a Utricles 7.0 mm long or longer (including beak and stipe when present) 3
2b Utricles not longer than 7.0 mm (including beak and stipe when present) 5

3a Leaf apices acute, 3-angled by the thickened scabrid margins and abaxially projecting midrib (not markedly tapering into long acuminate prolongations). Inflorescences greenish, pallid or light brown; when young, compact and almost hooded by wide lowermost bract (hooded effect lost with full development) .... 14. *S. schweickerdtii*
3b Leaf apices tapering into long acuminate, very slender prolongations. Inflorescence mid- to dark brown, lowest bract not markedly hooding young inflorescence 4

4a Partial inflorescences pendulous or not, more or less round in outline, spikelets long and narrow, carried on slender branchlets. Mature achenes 3.5–4.5 × 0.5–0.8 mm. Rachilla either with terminal male spikelet, or if sterile, extending beyond mouth of utricle. Plants usually glaucous .... 11. *S. madagascariense*
4b Partial inflorescences pendulous, variously shaped but not rounded in outline with delicate branchlets. Mature achenes 4.8–5.0 × 1.4–1.5 mm. Rachilla with a reduced scale at apex, extending to or just beyond mouth of utricle. Plants green .... 5. *S. burttii*

5a Achene narrowed subapically to a neck below small podium to which style attaches. Style pilose .... 3. *S. buchananii*
5b Achene narrowed terminally to point of meeting with style base, thus lacking a subapical neck. Style glabrous (but style branches pilose or furry) 6

6a Achene not wider than 1 mm. Partial inflorescences more or less round in outline, spikelets long and narrow, carried on slender branchlets .... 11. *S. madagascariense*
6b Achene wider than 1 mm. Partial inflorescences not as for the contrast 7

7a Style base pyramidal. Male spikelets light fawn or pale golden brown, much longer than utricles. Male glumes acuminate. Utricle mouth membranous, irregular, not beaked ... 4. *S. burkei*
7b Style base not pyramidal, (sometimes slightly swollen or asymmetric at attachment of achene). Male spikelets medium- to dark brown, approximately equalling or only slightly longer than utricles. Utricle mouth beaked, often minutely scabrous externally ... 8

8a Utricle 4.2–4.5 mm long, often markedly curved. Achene about 2.5 × 1.5 mm, with an invagination on the plane face, and an asymmetric apex ... 13. *S. rufum*
8b Utricle 4.7–5.5 mm long, straight or almost so. Achene about 3.0 × 2.0 mm, without an invagination on the plane face, and with a symmetric apex ... 10. *S. ludwigii*
(Note: very close indeed to *S. rufum* in general facies, but more robust and slightly larger in all its parts.)

9a Inflorescence with spikelets arising directly from main axis (first order branch). One or few additional partial inflorescences may be present at lower culm nodes (one per node). (Note: when young, spikelets lie adpressed upwards against main inflorescence axis; they later become patent and lie at right angles to axis before eventually recurving and abscising. Young and old aspects contrast strongly.) ... 8. *S. filiforme* (including *S. molle* and *S. strictum*).
9b Inflorescence with spikelets arising from branchings of main axis (all, or some, of second, third and fourth order branches). Additional partial inflorescences from lower culm nodes may, or may not, be present ... 10

10a Inflorescence consisting of a terminal portion only. Lowest inflorescence bract widened basally, but not forming a closed enveloping sheath to the inflorescence base ... 11
10b Inflorescence consisting of a terminal portion with other partial inflorescences developed from lower culm nodes. Each inflorescence bract with a base forming a closed enveloping sheath to the culm for at least 15 mm above node from which it arises ... 12

11a Utricle 3.5–4.0 mm long with an uneven membranous mouth and no defined beak. Achene 2.5–2.8 mm long ... 7. *S. distinctum*
11b Utricle 6.5–7.0 mm long with a beak 1.6–1.8 mm long. Achene longer than 4.0 mm ... 1. *S. basutorum*

12a Utricle 4.5–5.5 mm long including a beak 1.2–2.2 mm long and a basal stipe about 0.5 mm long (undergrowth plants in shade of trees; often along forest paths) ... 9. *S. lehmannii*
12b Utricle variable in length with a beak not longer than 1.0 mm, or hardly beaked; basal stipe present or not, but never as long as 0.5 mm (plants of grassland, except *S. perdensum* (including *S. schimperianum*) which may grow in relatively shaded situations under trees) ... 13

13a Rachilla within utricle about half achene length (sometimes more reduced or undeveloped). Partial inflorescences densely congested, shortly pyramidal; main subtending bract 40–50 mm long, with expanded sheath ± 4 mm wide and a long acuminate apex. Achene 2.0–2.5 × 1.75 mm, usually with a short length of persistent style attached to a minute podium. Utricle 2.5–3.0 × (1.3–)1.5–2.0 mm, gradually narrowing to apex with a very short, or no defined beak ... 6. *S. caricoides*
13b Rachilla within utricle as long, or longer, than achene, often protruding slightly through utricle mouth. Other features differing in some, or all, particulars from the contrast ... 14

14a Plants slender with delicate culms (1 mm wide), partial inflorescences distantly spaced giving a lax, fragile appearance. Leaves mostly 1.5–2.0 mm wide (coastal specimens 3.0–4.0 mm). Utricles (2–)4–5 per partial inflorescence, more or less two-ranked on scabrid axis; subtending glumes early caducous. ... 12. *S. perdensum* (including plants named *S. schimperianum* (Boeck.) C.B. Clarke)
14b Plants medium (grass-like) with firm culms (2 mm wide) carrying 2–3(–5–7) partial inflorescences (1 per culm node) usually fairly closely approximated to one another, either towards culm apex or less commonly some partially hidden amongst leaves. Utricles many more than 5 per partial inflorescence, crowded, not distichous; subtending glumes not falling early ... 15

15a Utricles 3.2–4.0 (including 0.4–0.7 mm beak) × 1.3–1.4 mm, planoconvex to almost straight ... 2. *S. bracteosum*
15b Utricles (2.0–)2.5–2.9 (including under 0.6 mm long beak) × 1.5–1.7 mm, planoconvex ... 15. *S. sparteum*

1. **Schoenoxiphium basutorum** *Turrill* in Kew Bulletin 1914: 19 (1914); Schönland: 66 (1922); Kukkonen: 823 (1983). Type: Basutoland (Lesotho): Plateau, Leribe Mount, *Dieterlen 948* (K, holo.).

Vouchers: no authentic specimen seen.

Description: Turrill: 19 (1914) protologue.

Distribution: probably Uplands.

According to Turrill (1914), the affinity of this species is with *S. lanceum* (Thunb.) Kük., but it is distinguished by narrower leaf blades and longer male spikelets. It has not been much collected in Natal, if at all. Neither Hilliard (1987) nor Hilliard & Burtt (1987), record it for the Drakensberg, but Kukkonen (1983) shows its distribution to be wide (from Lesotho and Natal to the Cape, where it becomes sympatric with *S. lanceum* towards the western limit of its range).

2. **Schoenoxiphium bracteosum** *Kukkonen* in Notes from the Royal Botanic Garden Edinburgh 43: 365 (1986); Hilliard: 62 (1987); Hilliard & B.L. Burtt: 116 (1987). Type: Cape Province, Barkly East Dist., Ben McDhui, 2 750 m, in grass tussocks on hillside, *Hilliard & B.L. Burtt 16471* (H, holo.; E, NU, iso.). Figure 71A–C.

Vouchers: *Hilliard & B.L. Burtt 14908, 16015, 17922.*

Description: Kukkonen: 365 (1986) protologue.

Distribution: Uplands.

Tufted perennials of damp slopes, streambanks and crevices of rock flushes, growing usually in association with grasses. Closely allied to *S. sparteum* (No. 15), which is smaller in stature and in size of most of floral organs. Also close relationship with *S. caricoides* (No. 6), but in this taxon partial inflorescences dense and shortly pyramidal with enclosing bracts conspicuous because of their wide bases and elongate apices. Rachilla of *S. caricoides* is about half achene length or less, whereas in *S. bracteosum* and *S. sparteum* it is as long or longer, often just protruding through utricle mouth.

3. **Schoenoxiphium buchananii** *C.B. Clarke* in Conspectus florae africae 5: 676 (1894b) nom. nud.;

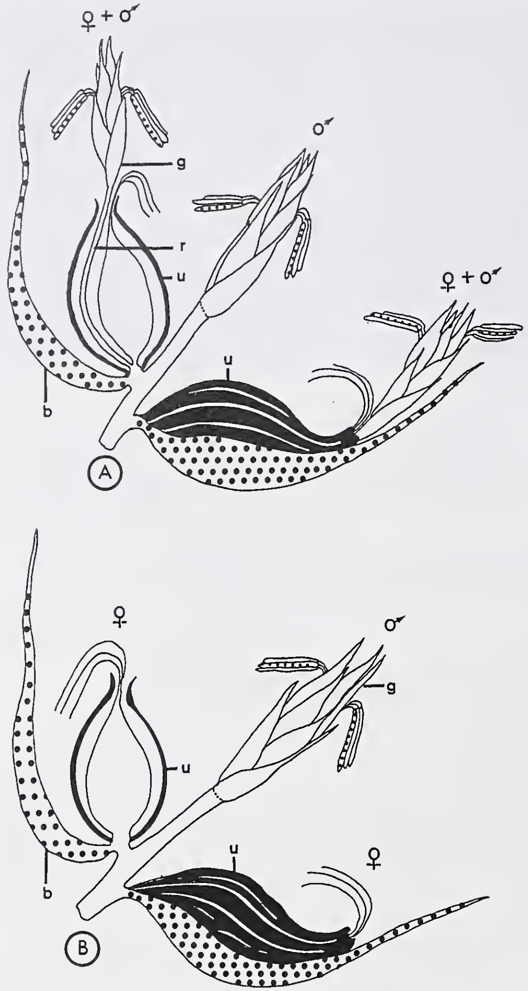

FIGURE 70.—Diagrammatic representation of portion of an inflorescence. A, *Schoenoxiphium*: main axis carries a succession of bracts (b); two lowest bracts (dotted) each subtend subsidiary axes carrying a utricle (u) enclosing a female floret (ovary with style branches), and a rachilla (r); rachilla carries bracts (glumes, g) that each subtend one male floret, to collectively form a terminal male spikelet; upper bracts of main axis also subtend male florets to form another male floret terminal to that axis; rachilla not always as well developed as shown here, may be reduced to flattened, often scabrid-margined outgrowth that protrudes through utricle mouth, with, or without, apical rudimentary outgrowths (reduced glumes), or may be reduced to a flap of tissue within utricle, about half the length of ovary it accompanies. B, *Carex*: as for A, except that rachilla is so reduced as to be entirely lacking; in some species of *Carex*, female and male florets segregated on different branches of inflorescence, or a zone of female florets may be topped, or very occasionally interrupted by, a zone of male florets; in a few extra-African *Carex* spp., minute remnant of a rachilla may be present within utricle, but this is never so in Natal species.

Schönland: 66 (1922); Hilliard: 63 (1987). Type: Natal, without locality, *Buchanan 134* (K, holo.). Figure 71D–F.

Carex buchananii (C.B. Clarke) C.B. Clarke: 305 (1897/98). *Kobresia buchananii* (C.B. Clarke) T. Koyama: 80 (1961).

Vouchers: *Hilliard & B.L. Burtt 13365, 18037; McKeown 129, 140.*

Description: C.B. Clarke: 305 (1897/98) as *Carex buchananii.*

Distribution: Uplands.

Plants robust, rhizomatous perennials with wide leaves, occurring on damp slopes among coarse grass, small shrubs and boulders and along streambanks where they may form dense stands. General facies resembles *S. burttii* (No. 5) but slightly smaller with more diffuse inflorescences. Achene narrowed into a short neck below small podium to which style is attached. Neck and pilose style serve to identify species.

4. **Schoenoxiphium burkei** *C.B. Clarke* in Journal of the Linnean Society, Botany 20: 386 (1883b). Type: Cape Province, Cradock Div., near Cradock, *Burke 211* (K, holo.). Figure 71G–I.

Icones: C.B. Clarke: t. 30, fig. 8 (1883b). [Clarke: 298 (1897/98), comments 'nut shown rather too narrow'.]

Vouchers: *Hilliard & B.L. Burtt 14572, 14588, 16399* (Cape Province, Barkly East Dist.); *Van Zinderen Bakker jnr 87, 177* (Orange Free State, Clocolan).

Description: C.B. Clarke: 386 (1883b) protologue.

Distribution: not yet recorded for Natal, but species likely to be represented in Uplands.

Plants rhizomatous, loosely tufted, fairly robust perennials with leaves 4–5 mm wide that terminate in narrow prolonged downward-curling apices; occurring with grasses and suffrutices amongst basalt and dolerite rocks. Before inflorescences begin to break up in age, are conspicuous by pale golden brown male spikelets, approximately twice length of green, strongly-veined utricles. Acuminate male glumes, and persistent pyramidal style base of elliptic, trigonous achene are other useful diagnostic features.

5. **Schoenoxiphium burttii** *Kukkonen* in Notes from the Royal Botanic Garden Edinburgh 43: 365 (1986); Hilliard: 63 (1987); Hilliard & B.L. Burtt: 116 (1987). Type: Natal, Underberg Dist., Chameleon Cave area, N of Castle View Farm, 2 000 m, forming loose clumps at streamside, *Hilliard & B.L. Burtt 17812* (H, holo; E, NU, iso.). Figure 71J–L.

Icones: Hilliard & B.L. Burtt: t. 9D (1987).

Vouchers: *Hilliard & B.L. Burtt 16852, 17154, 18609.*

Description: Kukkonen: 365 (1986) protologue.

Distribution: Uplands.

Plants occur along streambanks and on steep, rocky slopes among grasses and small shrubs. Robust stoloniferous perennials with leaves up to 12 mm wide, culms to 1 m high with 5 or more partial inflorescences, all drooping with weight of clustered dark brown spikelets. Utricles about 7 mm long including 2 mm long beak through which slender, slightly flattened rachilla just projects. Relationship is with *S. buchananii* (No. 3), but achene of *S. burttii* narrows apically without presence of a neck.

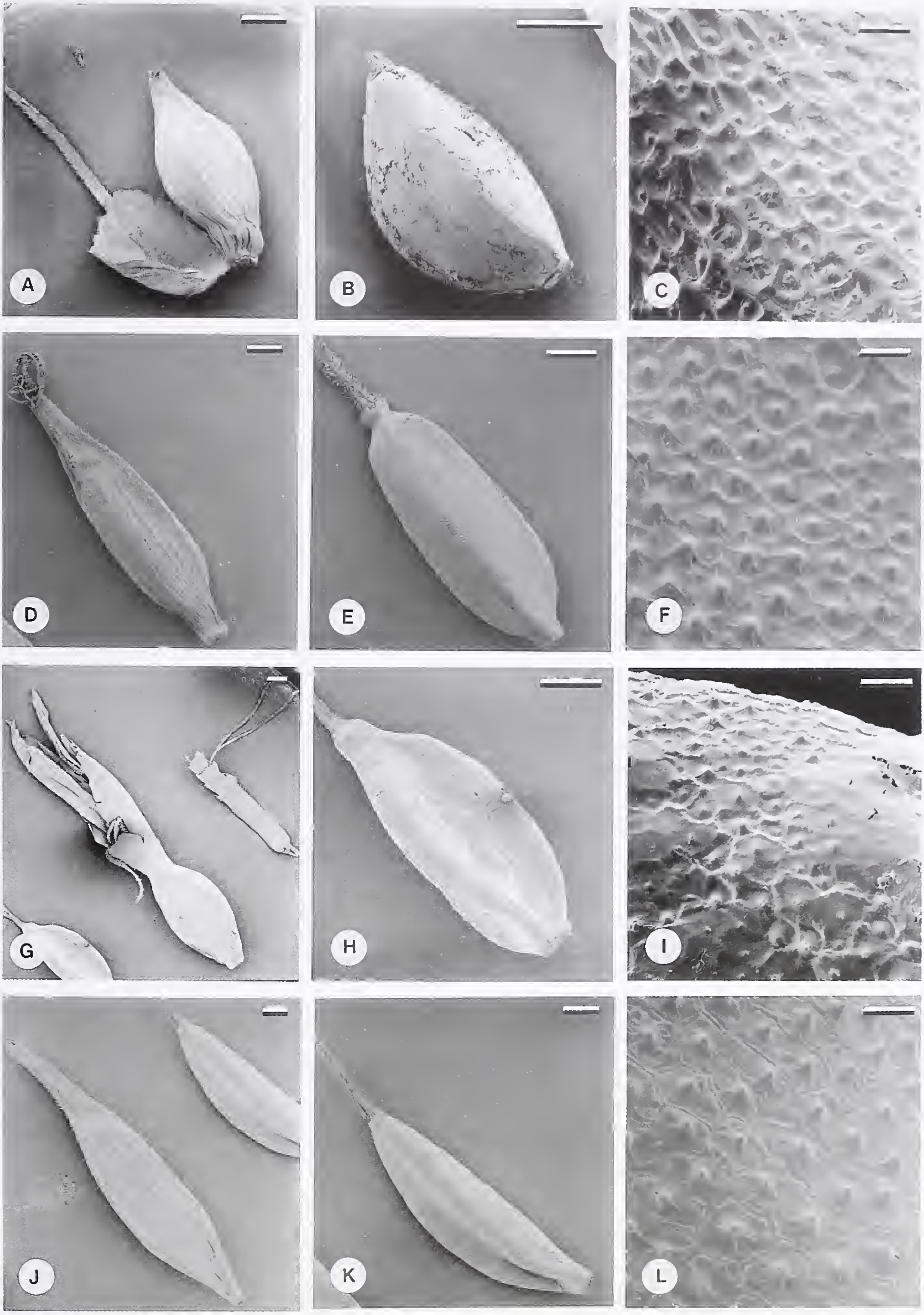

FIGURE 71.—*Schoenoxiphium*. A–C, *S. bracteosum*, *Hilliard & B.L. Burtt 16471*; D–F, *S. buchananii*, *Hilliard & B.L. Burtt 18037*; G–I, *S. burkei*, *Van Zinderen Bakker jr 87* (BLFU); J–L, *S. burttii*, *Hilliard & B.L. Burtt 17812*. A, utricle + subtending glume; D, utricle; G, utricle with ovary + rachilla; J, utricle + ovary. Scale bars: A, B, D, E, G, H, J, K, 500 µm; C, F, I, L, 25 µm.

6. **Schoenoxiphium caricoides** *C.B. Clarke* in Kew Bulletin, Additional Series 8: 67 (1908); Schönland: 66 (1922); R.W. Haines & Lye: 367 (1983); Hilliard: 63 (1987); Hilliard & B.L. Burtt: 116 (1987). Syntypes: South Africa, Zwellendam, alt. 1 000 m, *Zeyher 4440* (K); Alexandria, *Drège*; Tembuland, *Baur 744*. Figure 72A–C.

Carex dregeana Kunth: 511 (1837); C.B. Clarke: 303 (1897/98). *Schoenoxiphium dregeanum* (Kunth) C.B. Clarke: 298 (1897/98); *Kobresia dregeana* (Kunth) T. Koyama: 80 (1961).

Icones: R.W. Haines & Lye: fig. 760 (1983).

Vouchers: *T. Edwards 327; K.D. Gordon-Gray 5041; Hilliard & B.L. Burtt 16058; C.J. Ward 641.*

Description: C.B. Clarke: 67 (1908).

Distribution: Coast, Midlands, Uplands.

Frequent in Natal. No reliable records for N Natal and Zululand, but the species is likely to be present in these areas.

Tufted, perennial plants; components of grassland and particularly conspicuous in spring, following upon winter burning before a dense grass cover has developed. Pyramidal inflorescence units with their conspicuous bracts are a good preliminary means of identification; should be confirmed by examination of rachilla within utricle. [See also under *S. bracteosum* (No. 2) and *S. sparteum* (No. 15), both of which are closely related.]

7. **Schoenoxiphium distinctum** *Kukkonen* in Botaniska Notiser 131: 263 (1978); Kukkonen: 819 (1983); Hilliard: 63 (1987); Hilliard & B.L. Burtt: 116 (1987). Type: Lesotho, between Indumeni Dome and Castle Buttress, ± 2 900 m. *Killick 2274* (BM, holo.; K, iso.). Figure 72D–F.

Icones: Kukkonen: fig. 1 (1978).

Vouchers: *Hilliard & B.L. Burtt 14122, 17492; Killick 2272.*

Description: Kukkonen: 263 (1978) protologue.

Distribution: Uplands.

Plants shortly rhizomatous, caespitose perennials generally under 0.5 m high; components of alpine grassland among rock outcrops and on cliffs in damp soil. Inflorescences usually terminate culms and lack partial inflorescences from lower nodes. Lowest bract (about 30 mm long) with wide sheath that narrows into a long acuminate tip shorter than total inflorescence length. These features, and utricles with irregular scarious mouths slightly cleft adaxially and not beaked, are the most reliable diagnostic criteria.

8. **Schoenoxiphium filiforme** *Kük.* in Kew Bulletin 1910: 129 (1910); Kukkonen: 819 (1986); Hilliard: 62 (1987); Hilliard & B.L. Burtt: 116 (1987). Type: S Africa, Cape Province, 'summit of Great Winterberg', ± 2 200 m, *Galpin 5605* (K, holo.). Figure 72G–I.

Carex killickii Nelmes: 89 (1955b). Type: Basutoland (Lesotho), between Indumeni Dome and Castle Buttress ± 2 800 m, *Killick 1848* (K, holo.; NU, PRE, iso.).

Icones: Davis in Hilliard: 63 (1987).

Vouchers: *Hilliard & B.L. Burtt 12495, 14693, 15181, 15744, 17601.*

Description: Kük. 129 (1910).

Distribution: Uplands.

S. filiforme is the type species of *Schoenoxiphium* subgenus *Galpinia* as delimited by Kükenthal (1910). Kukkonen (1986) established two new species, *S. molle* (Figure 73G–I) and *S. strictum* (Figure 74J–L), both of which he referred to the above subgenus.

S. molle is 'softer' than the other two species and *S. strictum* more xeromorphic.

The parameters given in the literature by which the species may be differentiated (Kükenthal 1910; Kukkonen 1983, 1986) are summarised in Table 3. However, in measuring the additional material now available, the limits given are too narrow, particularly for *S. filiforme*. It does not seem possible to rely on qualitative characters, apart from texture, for distinction, and so in this treatment the three taxa are dealt with collectively, considering them as ecotypes within *S. filiforme*, rather than as three clearly defined morphological species.

Plants of *S. filiforme sensu lato* are rather loosely caespitose perennials with lateral stolons (very slender in ecotypes *filiforme* and *molle*; somewhat wiry and slightly thicker in *strictum*). Plants inconspicuous in damp grassland; favour specialised localities listed in Table 3. Most reliably identified by inflorescence. Subgenus *Galpinia* is

TABLE 3.—Summary of more important parameters distinguishing *S. filiforme, S. molle* and *S. strictum* following Kükenthal (1910); Kukkonen (1983, 1986) (all measurements in mm)

	S. filiforme	*S. molle*	*S. strictum*
Leaf blade width	± 0.5	1.5–2.3	0.3–0.5
Female glume size	3.3–4.3 × 1.2–1.4	3.4–4.1 (breadth not given)	2.7 (breadth not given)
Utricle size (length, including beak)	3.5–3.8 × 0.8–1.0	4.6–4.7 × 0.6–0.7	4.3–4.6 × 0.6–0.8
Utricle beak length	1.0–1.2	1.5–1.6	0.8–1.0
Achene size	2.5 × 0.9	(not given)	2.6 × 0.8
Plant microhabitat (following Hilliard & Burtt 1987)	Marshy turf; streambanks; wet cliffs	Damp cliffs; cave mouths	Short, stony, grassland

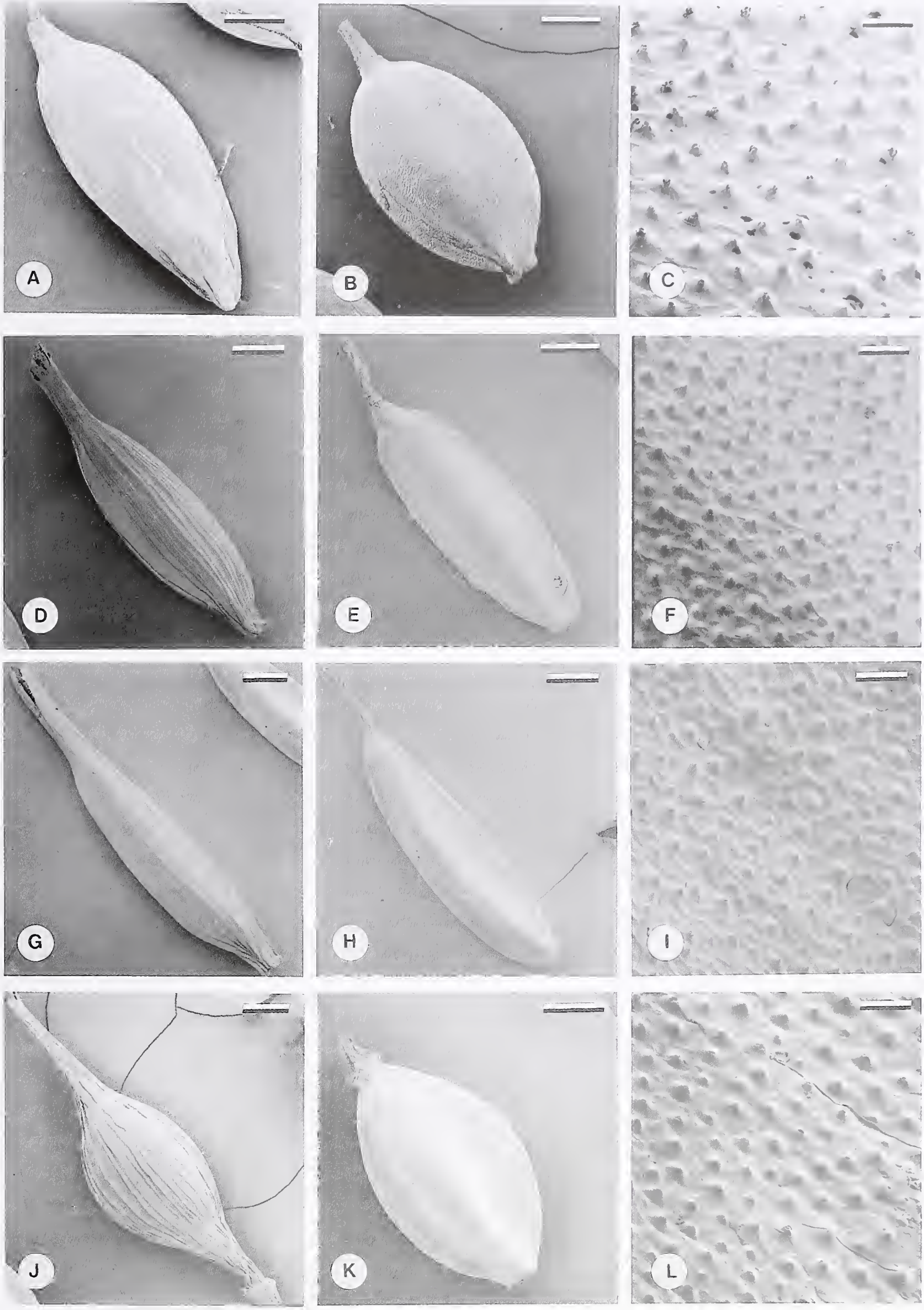

FIGURE 72.—*Schoenoxiphium*. A–C, *S. caricoides*, *Hilliard & B.L. Burtt 9595*; D–F, *S. distinctum*, *Hilliard & B.L. Burtt 14122*; G–I, *S. filiforme*, *Hilliard & B.L. Burtt 15181*; J–L, *S. lehmannii*, *Tinley 721*. A, D, G, J, utricles. Scale bars: A, B, D, E, G, H, J, K, 500 µm; C, F, I, L, 25 µm.

characterised by spikelets borne directly on main inflorescence axis. When young, directed upwards against axis. Later, bases become corky and slightly swollen resulting in female units becoming patent before eventually reflexing and falling. Female glume caducous. Young inflorescences look narrow and compact compared with later stages of development when spikelets spread at right angles from axis and each is clearly defined.

For those who prefer to follow Kukkonen's (1983, 1986) division of the plexus, *Hilliard & B.L. Burtt 13574* (H, holo.; E, NU, iso.) (Uplands) and *Hilliard & B.L. Burtt 14909* (H, holo.; E, NU, iso.) (Uplands) are the only specimens cited for *S. molle* and *S. strictum* respectively.

9. **Schoenoxiphium lehmannii** *(Nees) Steud.*, Synopsis plantarum glumacearum 2: 245 (1855); Kukkonen: 823 (1983); R.W. Haines & Lye: 366 (1983); Hilliard: 63 (1987); Hilliard & B.L. Burtt: 116 (1987). Type: 'Cap, östlicher Abhang des Tafelberges, bei Konstantia,' *Ecklon & Zeyher* (S, lecto., selected Kukkonen 1983). Figure 72J–L.

Uncinia lehmannii Nees: 206 (1835); *Kobresia lehmannii* (Nees) T. Koyama var. *lehmannii*: 80 (1961).

Carex uhligii K. Schum. ex C.B. Clarke: 73 (1908). Type: Tanzania, Usambara, alt. 1 800 m, *Uhlig 856* (K).

Icones: R.W. Haines & Lye: figs 756–758 (1983).

Vouchers: *Hilliard & B.L. Burtt 14436, 15407; K.D. Gordon-Gray 6203; Nixon 111; Tinley 721.*

Description: R.W. Haines & Lye: 366 (1983).

Distribution: Coast, Midlands, Uplands, N Natal.

Tufted, leafy, perennial plants; component of understorey in more open areas of forest, particularly along pathways. Short rhizomes and shoot bases they hold together, become clothed in dark brown or black fibres (as in most of medium-sized, grassland species). Leaf blades up to 4 mm wide; rather lax inflorescence of usually fairly widely spaced, relatively few-flowered units and utricles 4.5–5.5 mm long, each with a beak of 1.2–2.2 mm and a basal stipe about 0.5 mm long and golden brown when mature, make the species one of the easiest to identify.

A gathering from Oribi Gorge (Port Shepstone Dist., *Davidson 2649* J, NU) resembles this species but is very robust with leaves 9 mm wide. Further field study is needed to determine whether such robust examples fall within the range of *S. lehmannii.*

10. **Schoenoxiphium ludwigii** *Hochst.* in Flora 28: 764 (1845); Hilliard: 63 (1987); Hilliard & B.L. Burtt: 116 (1987). Figure 73A–C.

Vouchers: *Hilliard & B.L. Burtt 13631, 15150, 16120, 17185, 17451.*

Distribution: Uplands.

Slightly more robust with larger floral organs than *Schoenoxiphium rufum* (No. 13). Similar in general facies, but utricles of *S. ludwigii* straight, whereas frequently curved in *S. rufum* (planoconvex in outline in both taxa). Scabrid projections on outer surface of utricular beak better developed in *S. ludwigii*. Dimensions given in key for utricles and achenes are best means of distinction, but discontinuities are slight and perhaps not absolute.

11. **Schoenoxiphium madagascariense** *Cherm.* in Bulletin Société Botanique de France 70: 299 (1923); Kukkonen: 819 (1983); Hilliard: 63 (1987). Type: 'Madagascar Centre, Mont Tsaratanana', 2 700 m, *Perrier de la Bâthie 2501* (P, holo.). Figure 73D–F.

Vouchers: *Hilliard & B.L. Burtt 15406 16270; Killick 1036; Strey 6379.*

Distribution: Uplands, southern Natal (Weza).

Plants generally robust, shortly rhizomatous, tufted perennials with leaf blades 6–10 mm wide (although depauperate plants may have leaves considerably narrower). Partial inflorescences rounded in outline with long, narrow utricles (5–9 × 0.7–1.8 mm) carried on delicate branchlets. Other useful criteria in diagnosis: very long, slender, tapering apices of leaf blades and bracts; slightly glaucous coloration of vegetative parts. *S. burttii* (No. 5) also has similar long tapering leaves and bracts, but partial inflorescences not rounded with delicate branchlets. Plants favour more open parts of forest patches, rocky outcrops, streambanks and damp grassy slopes.

12. **Schoenoxiphium perdensum** *Kukkonen* in Botaniska Notiser 131: 265 (1978); Kukkonen: 822 (1983). Type: Cape Province, King William's Town Dist., Keiskamma Hoek, near Ghulu Kop, 1 200 m, *R.A. Dyer 245a* (K, holo. and iso.).

Voucher: *Acocks 11463.*

Description: Kukkonen: 265 (1978) protologue.

Distribution: Uplands, Midlands.

Densely caespitose perennials with basal parts slightly swollen, aerial parts delicate. Partial inflorescences distant; each scant, consisting of 2–4, more or less distichous female utricles with a few male spikelets above. Female glumes, subtending utricles, fall early, exposing scabrid-margined axis. Male spikelets become very long with age. Included under *S. perdensum* are plants that have been named *S. schimperianum* (Boeck.) C.B. Clarke (Figure 74A–C). This name was first applied to tropical African specimens and antedates *S. perdensum*, but conspecificity has not yet been established. From the limited material of both species available, it seems safest not to attempt to diagnose their differences but to await Kukkonen's revision.

Plants occur in grassland, usually in sheltered situations, probably most delicate of genus in Natal. Plants that have been named *S. schimperianum* appear to be present in the Uplands (*Hilliard & B.L. Burtt 15429, 18047; C.J. Ward 6022*), Midlands (*N. Jacobsen 8*) and at the coast (*C.J. Ward 5480*). Distribution requires confirmation, since the upland plants are more delicate than those of lower altitudes.

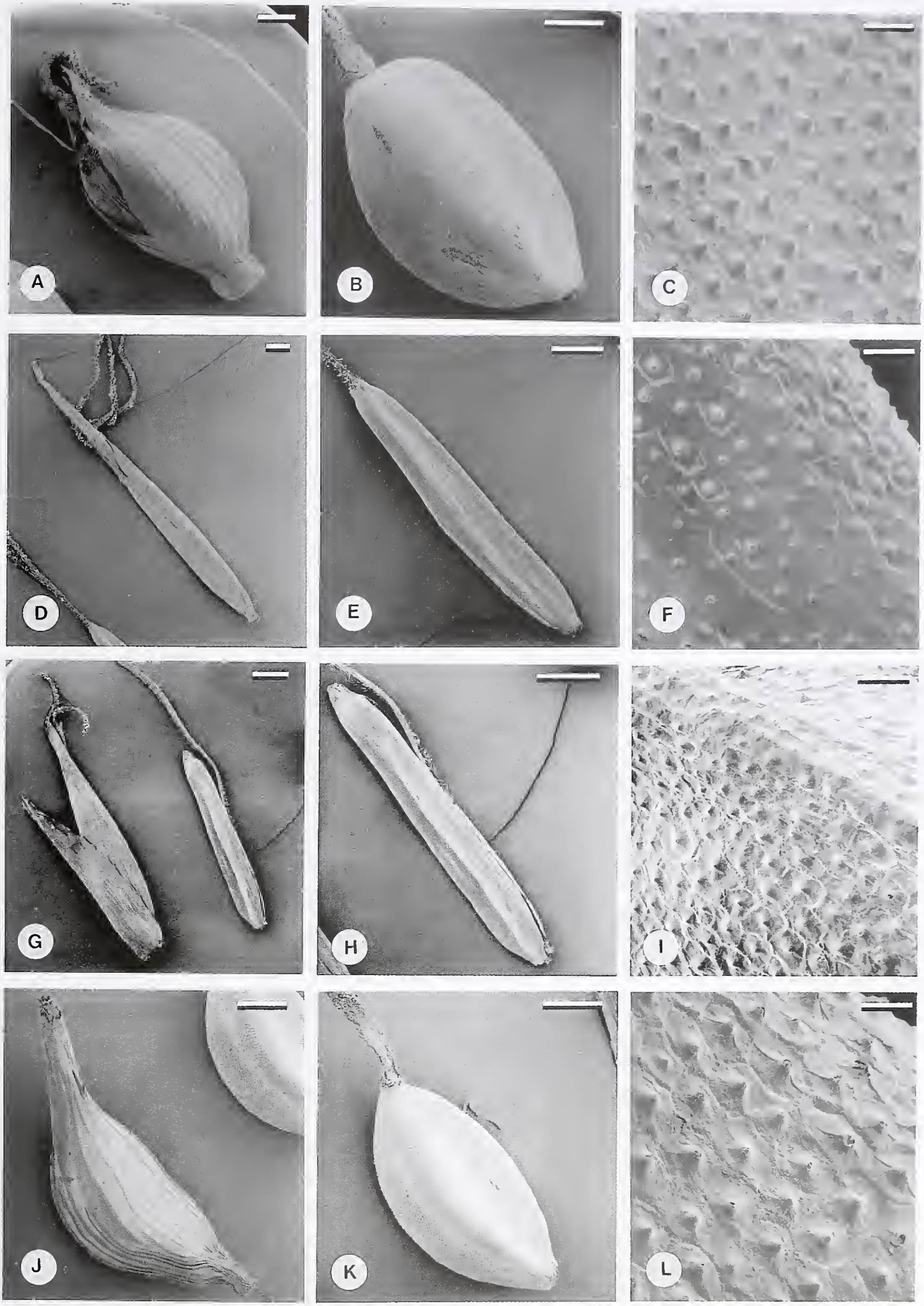

FIGURE 73.—*Schoenoxiphium*. A–C, *S. ludwigii, Hilliard & B.L. Burtt 16120*; D–F, *S. madagascariense, Hilliard & B.L. Burtt 16270*; G–I, *S. molle, Hilliard & B.L. Burtt 17790*; J–L, *S. rufum, Hilliard & B.L. Burtt 15161*. A, D, J, utricles; G, utricle + subtending glume. Scale bars: A, B, D, E, G, H, J, K, 500 µm; C, F, I, L, 25 µm.

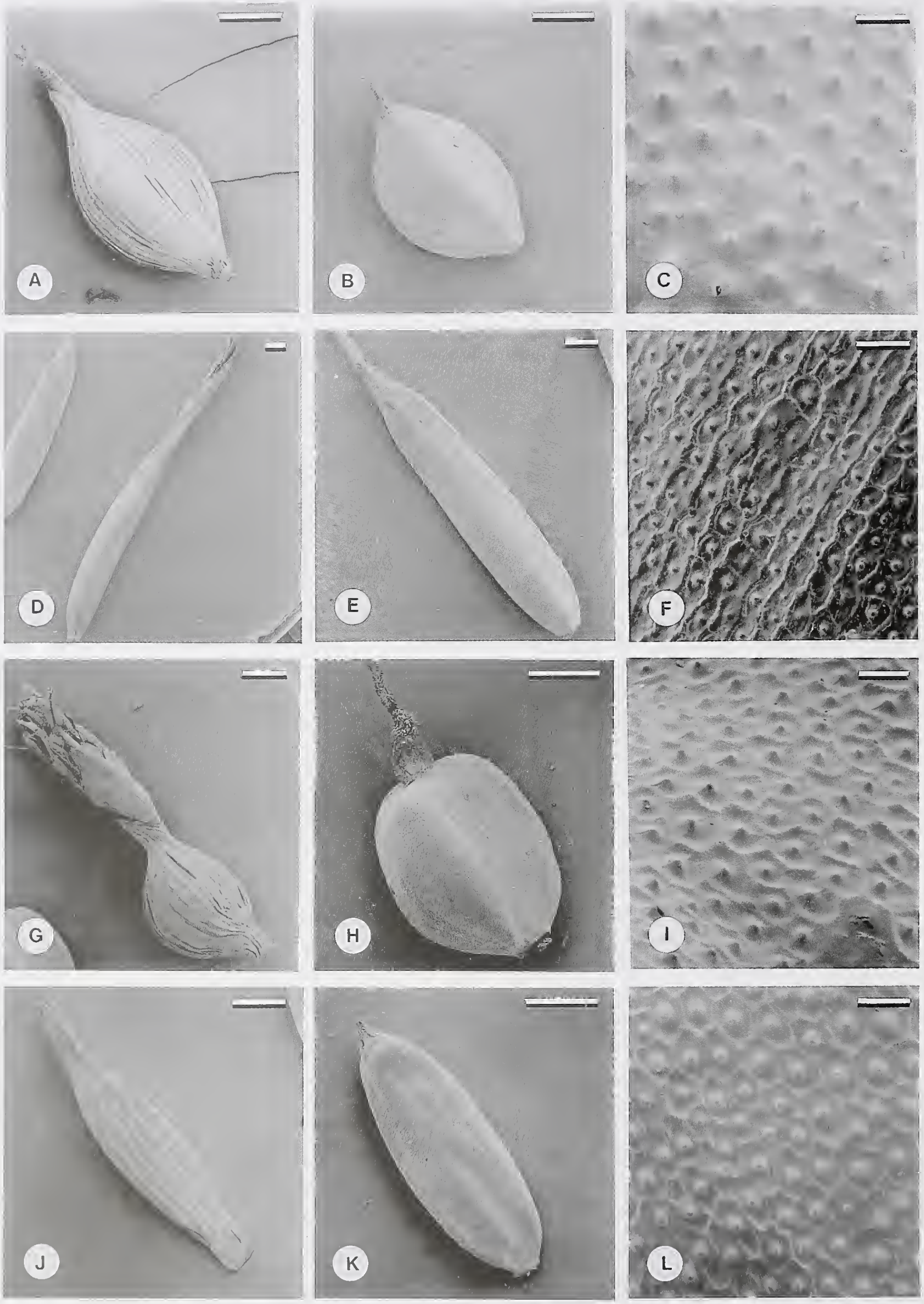

FIGURE 74.—*Schoenoxiphium*. A–C, *S. schimperianum*, *Hilliard & B.L. Burtt 15429*; D–F, *S. schweickerdtii*, *Bourdon 57* (CPF); G–I, *S. sparteum*, *J. Browning 227*; J–L, *S. strictum*, *Hilliard & B.L. Burtt 11714*. A, D, G, J, utricles. Scale bars: A, B, D, E, G, H, J, K, 500 µm; C, F, I, L, 25 µm.

13. **Schoenoxiphium rufum** *Nees* in Linnaea 10: 201 (1835); C.B. Clarke: 386 (1883b); C.B. Clarke: 298 (1897/98); Kük.: 30 (1909); Schönland: 66 (1922); R.W. Haines & Lye: 368 (1983); Hilliard: 63 (1987); Hilliard & B.L. Burtt: 116 (1987). Type: South Africa, Cape Province, 'Ceded Territory, bei Phillipstown am Katrivier', 2000–3000 ft, *Ecklon & Zeyher* (S, lecto. selected Kukkonen 1983). Figure 73J–L.

Kobresia rufa (Nees). T. Koyama: 80 (1961).

Icones: C.B. Clarke: t. 141, figs 1–6 (1909); R.W. Haines & Lye: fig. 761 (1983).

Vouchers: *Hilliard & B.L. Burtt 15133, 15450, 15759, 17550.*

Description: C.B. Clarke: 298 (1897/98).

Distribution: Uplands.

Plants rather coarse, loosely tufted, shortly stoloniferous perennials smaller than largest of Natal species of genus with leaf blades generally 4–7 mm wide, but otherwise similar in facies. Commonly present in damp grassland often among rocks or in damp overhangs; on margins of forest patches or in more open parts of woodland. Much confused with other species of genus. Very close to *S. ludwigii* (No. 10)—see key for differences. Achenes of *S. rufum* often show an invagination about the middle of the plane face. The signficance of this is not known, but it correlates with the curved, planoconvex utricles that provide a conspicuous, useful means of identification. Does curvature result from an infection? If so, may not be reliable in naming. Partial inflorescences carry many spikelets and droop on slender peduncles from successive culm nodes. 'Panicles' thus resemble those of *S. burttii* (No. 5) and *S. buchananii* (No. 3), but are generally smaller. Confusion is possible with *Carex zuluensis*, another robust perennial of forest glades, margins and rocky slopes. Utricles should be dissected to observe rachilla in *S. rufum* (absent in *C. zuluensis*).

14. **Schoenoxiphium schweickerdtii** *Merxm. & Podlech* in Podlech in Mitteilungen der Botanischen Staatssammlung, München 3: 529 (1960); Kukkonen: 819 (1983); Hilliard: 62 (1987); Hilliard & B.L. Burtt: 116 (1987). Type: South Africa, Transvaal, Drakensberg Mts, Mariepskop, 2 000 m, *Merxmüller 590* (M, holo.). Figure 74D–F.

Icones: Davis in Hilliard: 63 (1987).

Vouchers: *Bourdon 57* (CPF); *Hilliard & B.L. Burtt 12526, 13641, 15158, 17602; Rennie 1646.*

Description: Merxm. & Podlech: 529 (1960).

Distribution: Uplands.

Plants coarse, tufted, shortly rhizomatous perennials usually conspicuous amongst grasses on damp, often south-facing slopes. Leaf blades up to 10 mm wide with a well-marked lateral vein on either side of midrib on adaxial face. When young, greenish yellow to pallid inflorescences partially hooded by wide subtending bract. Towards maturity this effect is lost, but species may then be readily identified by long narrow utricles (7–9 × 0.7–0.9 mm) and by acute, 3-angled leaf apices (some of inflorescence bract apices may be acuminate, but not leaf tips).

15. **Schoenoxiphium sparteum** *(Wahlenb.) C.B. Clarke* in Kew Bulletin Additional Series 8: 67 (1908); Thunb.: 90 (1823); Kük.: 31 (1909); Schönland: 67 (1922); R.W. Haines & Lye: 367 (1983); Hilliard: 63 (1987). Type: locality unknown: in Herb. Thunberg (UPS). Figures 74G–I; 75.

Carex spartea Wahlenb.: 149 (1803); C.B. Clarke: 304 (1897/98). *Kobresia sparthea* (*spartea*) (Wahlenb.) T. Koyama: 80 (1961).

S. kunthianum Kük.: 31 (1909). *K. kunthiana* (Kük.) T. Koyama: 80 (1961).

Icones: Schönland t. 77 (1922); R.W. Haines & Lye: fig. 759 (1983).

Vouchers: *J. Browning 227; K.D. Gordon-Gray 5070.*

Description: R.W. Haines & Lye: 367 (1983).

Distribution: Coast, Midlands, Uplands.

In the past *S. sparteum* has formed the nucleus of a complex of species that are closely allied and difficult to distinguish. In this work the guidelines already provided by Kukkonen (information in NU and pers. comm.) have been followed in order to distinguish *S. bracteosum* (No. 2), *S. caricoides* (No. 6), and *S. perdensum* (No. 12) (including *S. schimperianum*) from *S. sparteum s.s.*), but it is probable that the differences recorded will not be entirely reliable.

S. sparteum is close to *S. bracteosum* in general facies, but plants shorter with floral organs smaller in most parts. It is fairly easily differentiated from *S. caricoides* on shape and density of partial inflorescences and in long rachilla (see under *S. bracteosum*). Plants of *S. perdensum* (including those named *S. schimperianum*) much more delicate and lax than those of *S. sparteum*, but in details of size and structure of floral organs differentiation is not always clearcut. Perhaps an inadequate range of specimens has been studied.

Plants of *S. sparteum* are shortly rhizomatous, mostly tufted, erect perennials (sometimes annuals ?) of grassland and damp, shaded cliffs. Shoot bases clothed in dark fibres formed by breakup of persistent sheaths.

0477000 SCHOENUS

Schoenus *L.*, Species plantarum: 42 (1753); L.: 26 (1754); C.B. Clarke: 271 (1897/98); Levyns: 120 (1950); Schönland: 57 (1922); R.A. Dyer: 886 (1976). Type species: *S. nigricans* L.

Schoenus is predominantly Australasian, with a few scattered representatives in Eurasia, Africa and America. The 'black-headed sedge' is the only S African species.

1. **Schoenus nigricans** *L.*, Species plantarum, edn 2: 64 (1762); C.B. Clarke: 272 (1897/98); C.B. Clarke: 484 (1901/02); Schönland: 57 (1922); Levyns 120 (1950). Figures 76; 77.

S. hypomelas Spreng.: 8 (1820). *S. aggregatus* Thunb.: 92 (1823).

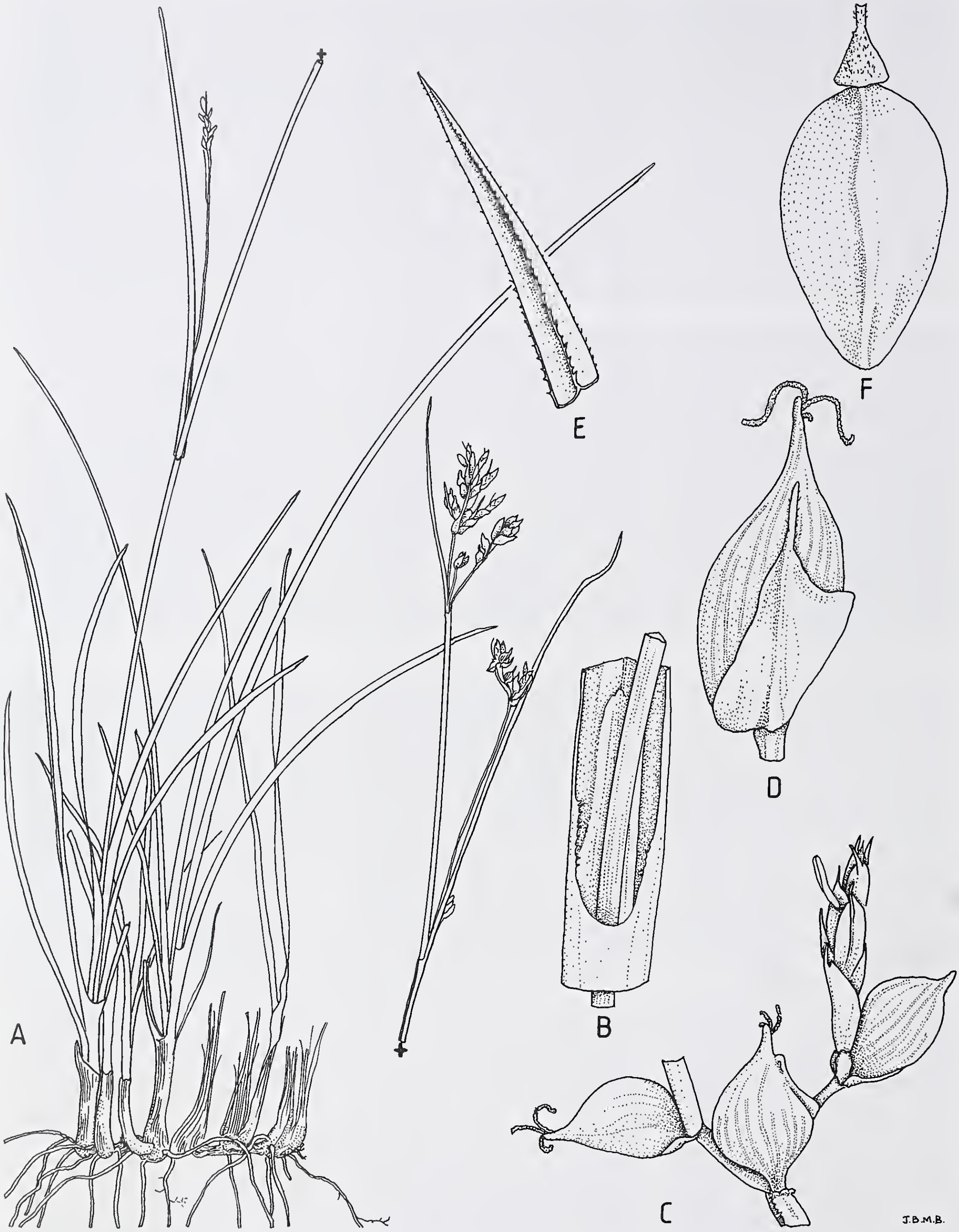

FIGURE 75.—*Schoenoxiphium sparteum, J. Browning 227.* A, plant, × 1; B, portion of leaf and culm at junction of lamina and sheath, × 8; C, portion of inflorescence showing two fertile utricles enclosing each a female floret, the central with a rachilla carrying another utricle and a male spikelet, × 10; D, fertile utricle, and subtending glume, × 20; E, apex of bract, × 32; F, immature achene, × 25.

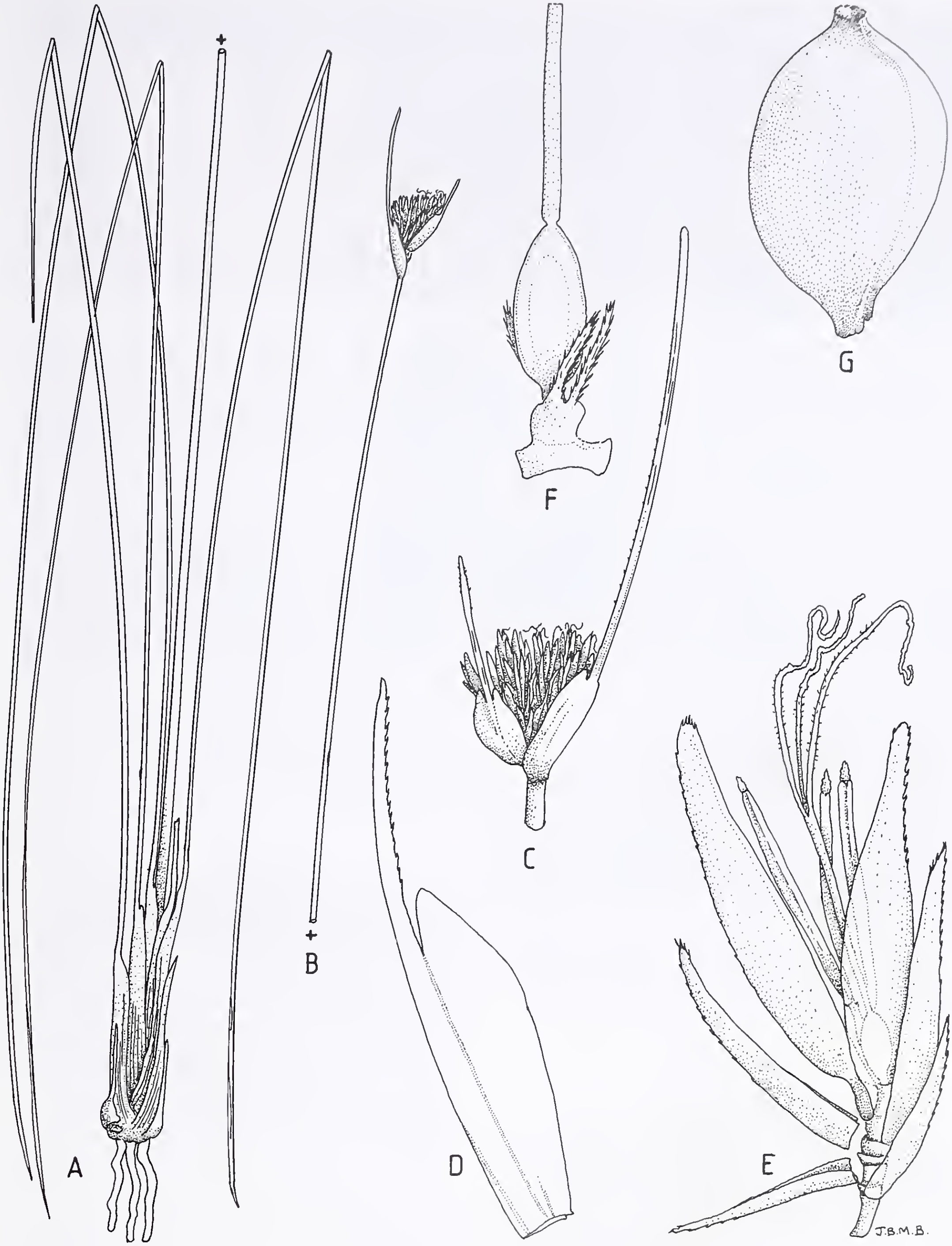

FIGURE 76.—*Schoenus nigricans.* A, plant, single shoot with culm, × 1; B, culm continuation with inflorescence, × 1; C, inflorescence, × 2; D, upper bract, × 7; E, spikelet with 2 of the lower glumes detached, remainder displaced to show floret, × 10; F, part of stigma and young ovary with 3 hypogynous scales, × 30; G, achene, × 36. A–E, *Strey 7739*; F, G, *Turrill & Montford 552.*

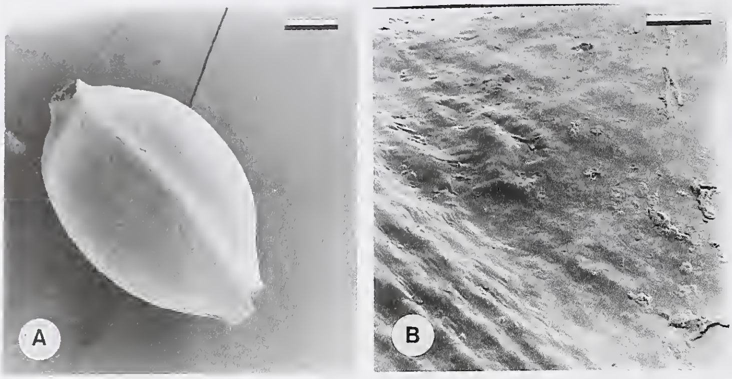

FIGURE 77.—*Schoenus*. A, B, *S. nigricans*, *Turrill & Montford 552*. Scale bars: A, 250 µm. B, 25 µm.

Chaetospora nigricans Kunth: 323 (1837).

Icones: Schönland: t. 62 (1922).

Vouchers: *Mogg 13937*; *Strey 7739*.

Description: C.B. Clarke: 272 (1897/98).

Distribution: South Coast (Port Shepstone area only).

S. nigricans is of limited distribution in Natal. Plants of *Strey 7739* grew in sand on the banks of the Izotsha River, a little south of Port Shepstone, whereas Mogg found his plants 'in fissures of gneiss rock in riverbed' (the name of the river not stated). Readily recognisable by unbranched, nodeless, erect, smooth culms each of which carries a single compact head of dark, blackish spikelets sheathed by two bracts, the lower with a long attenuate blade-like portion, the upper similar but considerably shorter. Schönland (1922) reported that in South Africa '*S. nigricans* L. is scattered in the southern coast districts, and is also found in Griqualand West ...'. Wider distribution in Somaliland and North Africa, western Europe to northwest India, the United States of America and Surinam. In Europe plants reported to require aluminium ions for growth (Sparling 1967a, b). Chromosome numbers: 2n = 54, 55.

Figure 77 shows achenes from *S. nigricans* collected in Britain (Dorset) as there were no mature achenes on the Natal specimens.

0468000 **SCIRPUS**

Scirpus *L.*, Species plantarum 1: 47 (1753); L.: 26 (1754); Kunth: 157 (1837); Steud.: 83 (1855); Boeck.: 475 (1869/70); C.B. Clarke: 210 (1897/98); C.B. Clarke: 446 (1901/02); Schönland: 36 (1922); Podlech: 44 (1967); R.A. Dyer: 884 (1976); P.L. Forbes: 59 (1987b). Type species: *Scirpus sylvaticus* L. (conservation proposed).

Note: there are conflicting opinions relating to the limits of this genus. In its traditional, broad sense it is regarded by some workers as unnatural (Raynal 1976b; Wilson 1981). These authorities believe its sections should be recognised as genera, distinct from *Scirpus sensu stricto* which, on this narrower delimitation, is restricted to temperate species and not represented in Africa. In contrast is Tucker (1987), who pointed out that the range of variation within *Scirpus* is comparable with the range within *Cyperus*, yet *Cyperus* is not a candidate for dismemberment. Tucker also stressed that *Scirpus sensu lato* (the third largest genus of Cyperaceae, with approximately 300 species) has suffered from the lack of a worldwide treatment.

As *Scirpus s.l.* is in process of segregation (the African representatives no less than those of other continents, see R.W. Haines & Lye 1983; Reid 1985), the more limited circumscription of the genus is followed in this work. As has already been pointed out *Scirpus s.s.*, does not occur in Africa, so there should be no species in Natal. However, after removal of species of *Schoenoplectus*, *Bolboschoenus* and *Isolepis* from *Scirpus s.l.* a small residue remains. The taxa constituting this residue are not adequately known for their natural relationships to be incontrovertibly determined. In consequence they remain in *Scirpus*. They do not necessarily show close relationship with one another.

Key to species

1a Leaves reduced to sheaths, blades lacking. Florets lacking hypogynous bristles, but with short gynophore bearing minute membranous outgrowths below achene but above stamens (St Lucia Estuary area only) .... 4. *S. nodosus*
1b Leaves with blades well developed 2

2a Florets lacking hypogynous bristles (rudiments may occasionally be detected) 3
2b Florets with hypogynous bristles (sometimes rather slender and delicate) 4

3a Inflorescence an anthela with many rays 20–90 mm long, margins of rays usually scabrous. Glumes not markedly aristate .... 1. *S. burkei*
3b Inflorescence a more or less globose head about 15 mm in diameter, with or without other stalked heads added. Glumes markedly aristate .... 5. *S. varius*

4a Tufted perennials with fine, wiry culms and leaves ... 2. *S. falsus*
4b Tufted perennials with coarse culms far more conspicuous than leaves .... 3. *S. ficinioides*

1. **Scirpus burkei** *C.B. Clarke* in Conspectus florae africae 5: 618 (1894b) nom. nud.; C.B. Clarke: 227 (1897/98) (description); P.L. Forbes: 61 (1987b). Syntypes: Transvaal, *Rehmann 4694, 6889* (K). Figure 78A, D.

S. schinzianus Boeck. ex C.B. Clarke: 618 (1894b). Syntypes as above.

Voucher: *Goetghebeur 4483*.

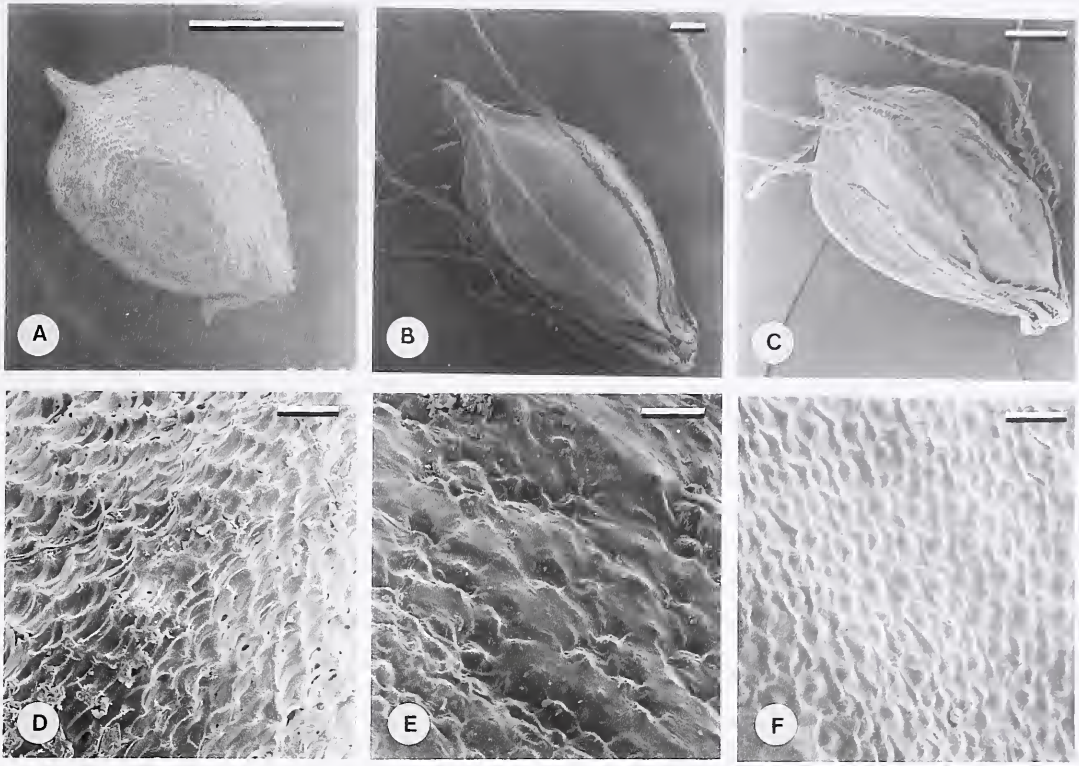

FIGURE 78.—*Scirpus*. A, D, *S. burkei*, *Lawson 824*; B, E, *S. falsus*, *Hilliard & B.L. Burtt 17418*; C, F, *S. ficinioides*, *Hilliard & B.L. Burtt 13800*. Scale bars: A–C, 250 μm; D–F, 25 μm.

Description: C.B. Clarke: 227 (1897/98).

Distribution: Uplands, N Natal (Vryheid area: sight record only).

S. burkei has a limited distribution in Natal. Forbes (1987b) remarked that for the Witwatersrand area of the Transvaal it is 'A common grassveld species ...'. Robust caespitose perennials with strong short, seriate rhizome clothed in persistent, brown papery sheaths. Leaves numerous, fine, rather stiff and channelled adaxially. Culms smooth, nodeless, 3-angled under the anthelate inflorescences that comprise rayed heads of congested, small (4–5 mm long) spikelets overtopped by long bracts similar to leaves. No other Natal sedge is likely to be confused with *S. burkei*. Plants, as a rule, are conspicuous in grassveld situations with a sandy substrate. These habitats appear dry on superficial inspection, but it is possible that underground water is present.

Goetghebeur (1986) transferred *S. burkei* to the genus *Scirpoides* Ség. = *Holoschoenus* Link, but the repositioning is not entirely satisfactory. Wilson (1981) regarded *Scirpoides* as a particular problem because two species referred there are not typical. These aberrants [*Scirpus nodosus* Rottb. (No. 4) and *S. prolifer* Rottb. = *Isolepis prolifera* (Rottb.) R. Br. (*Isolepis* No. 8)] are present in Natal. They, together with other species from the Cape Province, require detailed study. *Scirpus burkei* differs in that it is a coarse, much larger plant with an apparently terminal inflorescence. Generic limits for segregates from *Scirpus sensu stricto* are still under critical consideration (Goetghebeur & Simpson 1991).

2. **Scirpus falsus** *C.B. Clarke* in Flora capensis 7: 230 (1897/98); Schönland: 39 (1922); Hilliard: 57 (1987); Hilliard & B.L. Burtt: 114 (1987). Syntypes: Basutoland (Lesotho), Mont-aux-Sources, *Flanagan 2010*, *2011* (K). Figures 78B, E; 79.

Icones: Schönland t. 38 (1922); Davis in Hilliard: 57 (1987).

Vouchers: *J. Browning 195; Edwards 599, 600; Hilliard & B.L. Burtt 13517, 17418; Killick 1188; Moll 1276.*

Description: C.B. Clarke: 230 (1897/98).

Distribution: Uplands, Midlands: Inhluzane near Dargle.

Plants are caespitose perennials with rather wiry, slender leaves that overtop the equally wiry culms. Inflorescence a compact head of dark brown spikelets. It may appear pseudolateral because of the continuation of the main bract in the line of the culm but, more often, gives the impression of being terminal. Antrorsely scabrous hypogynous bristles present. These, and the absence of a gynophore to the achene, preclude affinity with *Ficinia*, but in general facies the plants are alike. Spikelets frequently damaged, presumably by insects. Common in Uplands where plants form low-growing 'carpets' in moist moss on cliffs and rock sheets and as more isolated units in damp rocky soil or in wet seeps in grassveld. Affinities are with *Scirpoides* Ség., as far as has been determined.

3. **Scirpus ficinioides** *Kunth*, Enumeratio plantarum 2: 172 (1837); C.B. Clarke: 229 (1897/98); Hilliard: 57 (1987); Hilliard & B.L. Burtt: 115 (1987). Syntypes: Cape Province, Stockenstrom Div., Kat Berg, *Drège 3937, 3938* (K). Figure 78C, F.

S. kunthii Boeck.: 508 (1869/70).

Vouchers: *Hilliard & B.L. Burtt 12593, 13800; K.D. Huntley 467; Johnstone 532.*

Description: C.B. Clarke: 229 (1897/98).

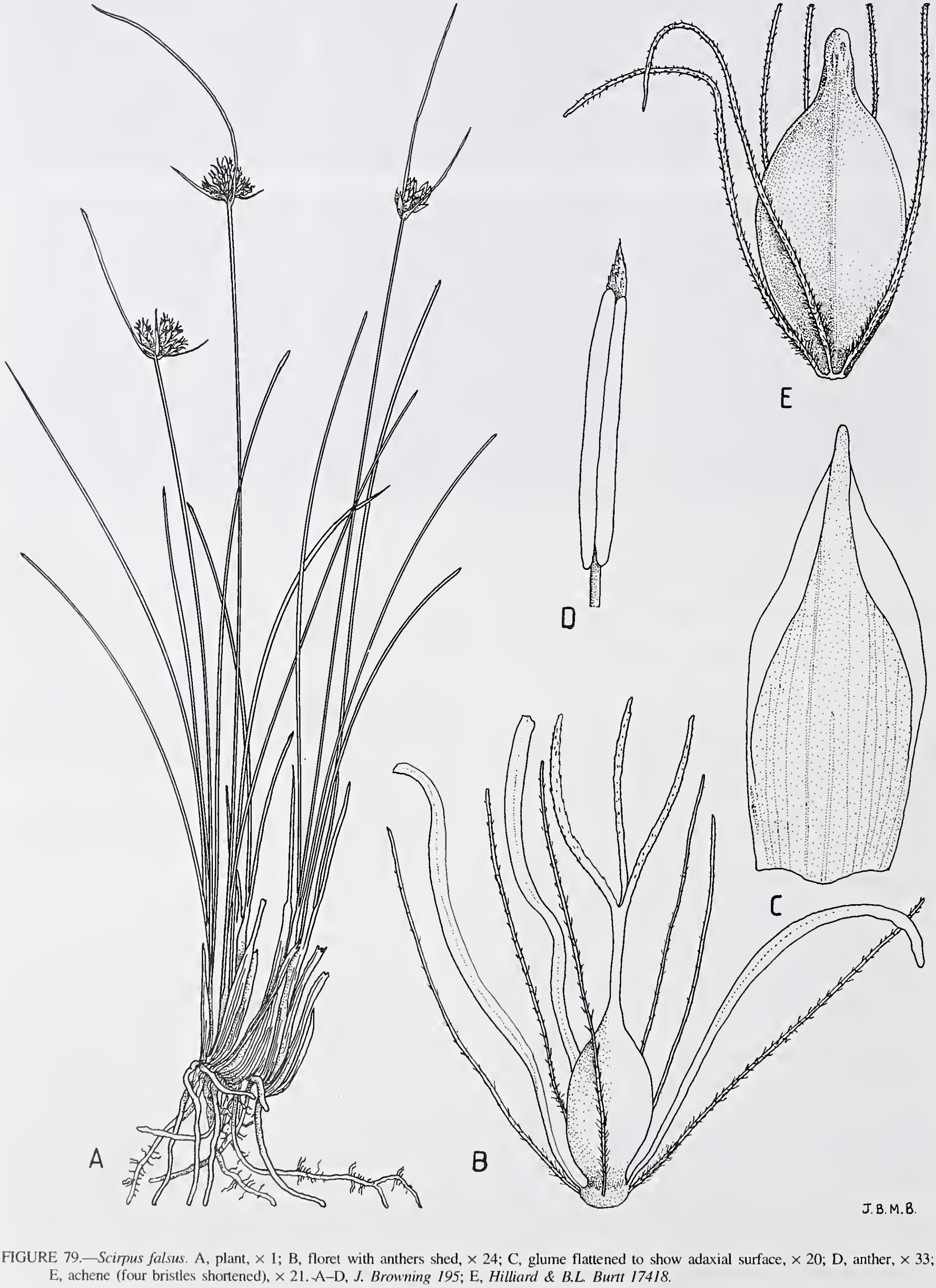

FIGURE 79.—*Scirpus falsus*. A, plant, × 1; B, floret with anthers shed, × 24; C, glume flattened to show adaxial surface, × 20; D, anther, × 33; E, achene (four bristles shortened), × 21. A–D, *J. Browning 195*; E, *Hilliard & B.L. Burtt 17418*.

Distribution: Midlands, Uplands, N Natal.

Plants taller and more robust than those of *S. falsus* (No. 2). Rhizome better developed and more elongated. Firm, erect, rounded culm and lateral, head-like brown inflorescence with a long overtopping bract resemble *Schoenoplectus* species but *S. ficinioides* may also be mistaken for a species of *Ficinia* or *Juncus*. A floret is accompanied by slender hypogynous bristles with retrorse barbs. Occasional in Midlands and N Natal, more frequent in Uplands, in wet grassland and along stream verges. Plants may be useful indicators of presence of underground water.

4. **Scirpus nodosus** *Rottb.*, Descriptiones plantarum rariorum: 24 (1772); Rottb.: 52 (1773); Boeck.: 719 (1869/70); C.B. Clarke: 628 (1894b); C.B. Clarke: 225 (1897/98); Levyns: 30 (1944); Levyns: 106 (1950); J. Browning: 423 (1989). Type: South Africa, *Koenig s.n.* (C, holo.). Figure 80A, C.

Isolepis nodosa (Rottb.) R. Br.: 221 (1810); Nees: 296 (1828); Kunth: 199 (1837). *Holoschoenus nodosus* (Rottb.) A. Dietr.: 165 (1832/33).

Icones: J. Browning: figs 1, 2, 5 (3–7) (1989).

Vouchers: *Pooley 2186; Taylor 432; C.J. Ward 7671.*

Description: J. Browning: 423 (1989).

Distribution: Maputaland (St Lucia Estuary only).

Rare in Natal. Plants colonise open sandy areas where water is available. A strong, uniseriate rhizome clothed in persistent, imbricated, dark brown scale leaves carries the usually contiguous, obsurely triangular, nodeless culms bearing basal sheaths, the uppermost with a truncate mouth. Inflorescence of closely aggregated, brown spikelets appears lateral, due to the overtopping bract and gives the impression of close affinity with *Schoenoplectus* species, but florets lack hypogynous bristles. Above stamens, minute membranous outgrowths developed on axis. This unusual feature precludes relationship with *Schoenoplectus*, suggesting rather some connection with *Ficinia.*

5. **Scirpus varius** *Boeck. ex C.B. Clarke* in Conspectus florae africae: 634 (1894b) nom. nud.; C.B. Clarke: 229 (1897/98) (description); Podlech: 51 (1967); P.L. Forbes: 63 (1987b). Syntypes: Basutoland (Lesotho), Leribe, *Buchanan 225*. South Africa, Transvaal, Pretoria, Apies Poort, *Rehmann 4036*; Houtbosch, *Rehmann 5635*. Figure 80B, D.

Vouchers: *Acocks 10297, 11418.*

Description: C.B. Clarke: 229 (1897/98).

Distribution: Midlands: foot of Griffin's Hill, between Estcourt and Mooi River.

It is possible *S. varius* is no longer represented in the natural flora of Natal. The species has not been re-collected since Acocks's gathering in 1944. The locality has been affected by road-building and it is probable that the microhabitat (steep, wet rocky slope and wet places by roadside) has been grossly modified.

There are records from Botswana, Lesotho and Transvaal, but nowhere is the species common. Plants distinctive with

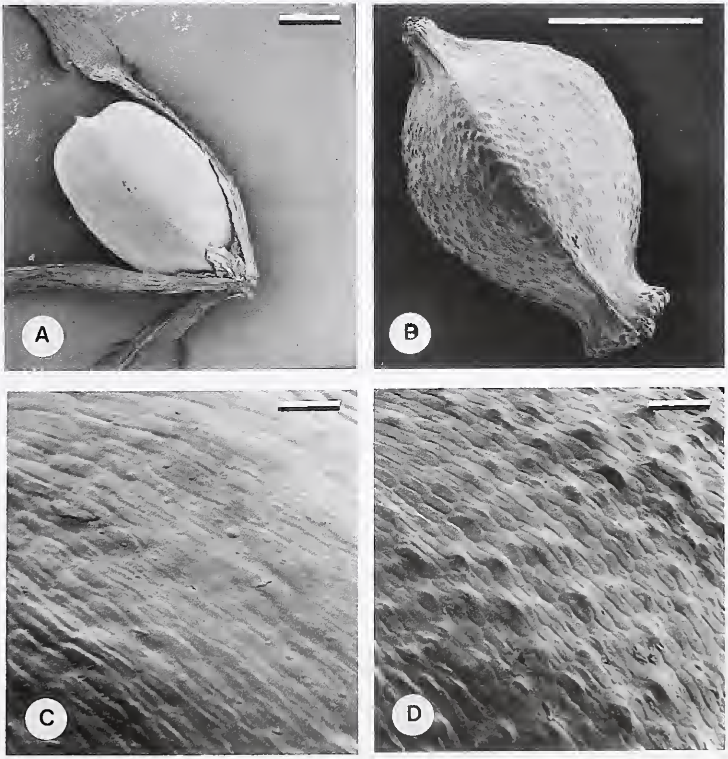

FIGURE 80.—*Scirpus*. A, C, *S. nodosus*, *J. Browning 146*; B, D, *S. varius*, *Acocks 11418* (PRE). Scale bars: A, B, 250 µm; C, D, 25 µm.

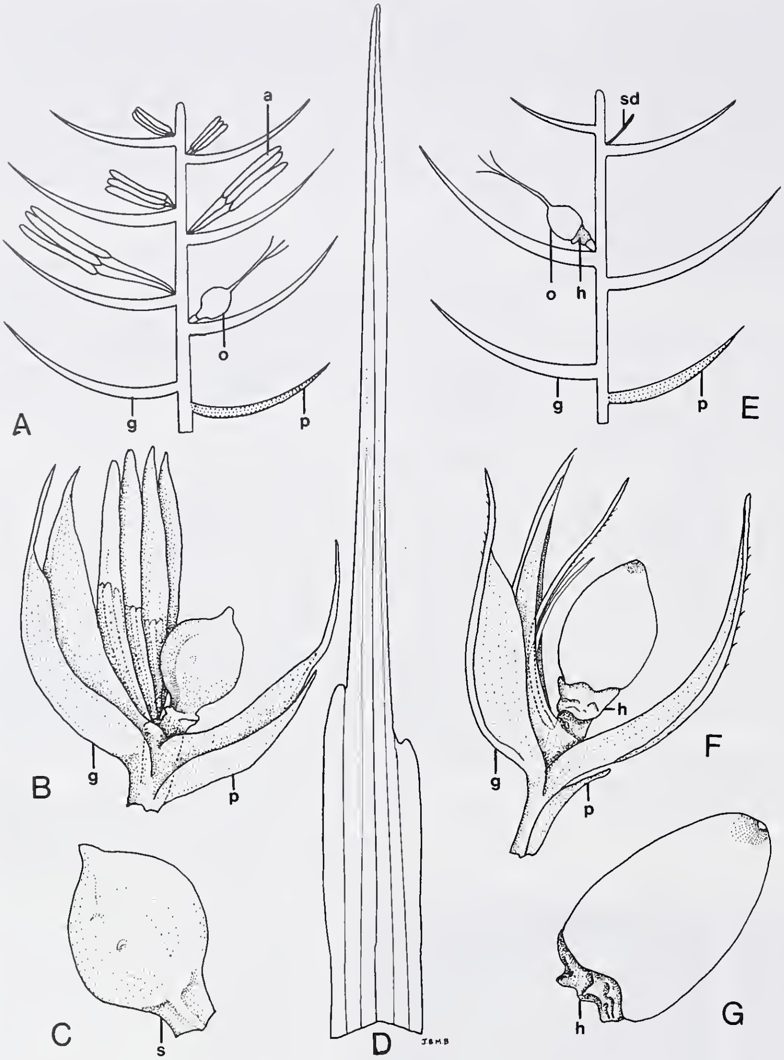

FIGURE 81.—*Scleria*. A–C: subgenus *Hypoporum*, *S. dregeana*: A, diagram of androgynous spikelet; B, mature spikelet with glumes displaced, × 14; C, achene with stipe and no hypogynium, × 23. D–G: subgenus *Scleria*. D, *S. angusta*, praemorse leaf. E–G, *S. melanomphala*. E, diagram of subandrogynous spikelet; F, mature spikelet with glumes displaced, × 7; G, achene with hyogynium, × 10. a, anther; g, glume; h, hypogynium; o, ovary; p, prophyll; s, stipe; sd, staminode.

culms and leaves stiff in texture, leaves nearly as long as trigonous culms that carry head-like inflorescences of closely packed, small greenish brown spikelets. Occasionally other stalked heads may accompany the main sessile one. Additional characteristic features are glumes, each with green keel attenuate into long, often recurved arista, and small trigonous achenes. Hypogynous bristles usually lacking, sometimes rudimentary. Clarke (1897/98) remarked, 'It does not appear allied to any other *Scirpus* species, except *S. mexicanus* Britton.' Among S African *Scirpus* species, its affinities are unclear. A detailed investigation is needed while some of its natural localities remain.

0515000 **SCLERIA**

Scleria *P.J. Bergius* in Kungliga vetenskaps academiens handligar 26: 142 (1765); C.B. Clarke: 293 (1897/98); C.B. Clarke: 137 (1900); C.B. Clarke: 493 (1901/02); Schönland: 64 (1922); Piérart: 1 (1951a); Nelmes: 415 (1955c); Nelmes: 73 (1956); Napper: 23 (1964); E.A. Rob.: 487 (1966); Podlech: 51 (1967); R.A. Dyer: 889 (1976); E.F. Franklin: 376 (1983a); R.W. Haines & Lye: 327 (1983); Hennessy: 512 (1985). Type species: *S. flagellum-nigrorum* P.J. Bergius.

Acriulus Ridl.: 336 (1883).

Note: there are other synonyms for which see Benth.: 1071 (1883).

Scleria is divided into two subgenera, namely:

subgenus **Hypoporum** *(Nees) C.B. Clarke*: 685 (1894b). Type species: *H. pergracile* Nees = *Scleria pergracilis* (Nees) Kunth (Natal species Nos: 3–7, 11, 13, 15, 16). Figure 81A–C.

Inflorescence terminal, simple or branched, glomerate-spicate (of separate sessile, head-like clusters of spikelets at intervals on axis). Bracts similar to glumes, sometimes the lower more leaf-like. Spikelets androgynous (with male and female organs) or androgynous and male. Hypogynium absent.

subgenus **Scleria** *(P.J. Bergius) C.B. Clarke*: 686 (1894b). Type species: *S. flagellum-nigrorum* P.J. Bergius (Natal species Nos: 1, 2, 8–10, 12, 14). Figure 81D–G.

Inflorescence terminal, or terminal and lateral, paniculate (sometimes sparsely so). Bracts leaf-like (except *S. poiformis*). Spikelets androgynous or female and male, or with evidence of reduction from androgynous (subandrogynous and male, or subandrogynous and female and male). Hypogynium present (Figure 81E–G). Additional features of the subgenera, including consideration of some aspects of reproductive biology and habitats, are given by Hennessy (1985).

Key to species

1a Plants tall (to 2.5 m), usually stout. Leaves 6–16 mm broad, pleated, at least some abruptly and unequally narrowed towards their apices. Inflorescence paniculate. Achene violet or purple; hypogynium obscurely trilobed with fimbriate margin. Shaded swamp forest, coast only .... 2. *S. angusta*
1b Not precisely as for the contrast 2

2a Leaf blades tapering towards their apices, 20–40 mm broad. Inflorescence paniculate, terminal, without (very rarely with) foliaceous bract. Achene globose, smooth, grey-brown or white; hypogynium small, obscurely trilobed, margins entire. Plants robust, forming almost pure stands in shallow coastal pans .... 12. *S. poiformis*
2b Leaf blades less than 20 mm broad. Inflorescence with foliaceous bracts, or bracts glumaceous (the lowest only sometimes subfoliaceous) 3

3a Plants stout or medium-sized. Inflorescence paniculate; bracts foliaceous. Hypogynium of achene present 4
3b Plants medium-sized to small and slender (0.5 m). Inflorescence spicate, branched or unbranched; bracts glumaceous (the lowest only sometimes subfoliaceous). Hypogynium of achene absent 8

4a Lateral panicles single at each node. Male spikelets 7–9 mm long. Achenes hairy (hairs sometimes sparse, but always present towards base); hypogynium small, white, with 3 acuminate, acute or bifid lobes. Leaves with sheaths and abaxial surface of ribs of blades villous. Coastbelt only .... 1. *S. achtenii*
4b Lateral panicles not always single at each node. Achenes entirely glabrous, smooth or patterned 5

5a Achenes smooth 6
5b Achenes patterned 7

6a Panicles lax. Female glumes 6–7 mm long, densely villous adaxially in distal half. Achene broadly ovoid, strongly beaked, pinkish brown, sometimes with violet blotches. Leaves crowded at base of culm; leaf margins scabrid .... 8. *S. greigiifolia*
6b Panicles compact, spiciform. Female glumes 7–11 mm long, glabrous adaxially. Achene ovoid, beakless, grey with blackish apex. Leaves ± evenly spaced along culm; leaf margins smooth .... 9. *S. melanomphala*

7a Culm bases 3–4 mm in diameter, not or hardly swollen. Foliaceous bract of terminal panicle sword-shaped, gradually tapering (3–4 mm broad 10 mm behind apex), longer than inflorescence .... 10. *S. natalensis*
7b Culm bases 9–10 mm in diameter, swollen. Foliaceous bract of terminal panicle awl-shaped, tapering from moderately broad base to very narrow fine point (1–2 mm broad 10 mm behind apex), sometimes exceeding inflorescence .. 14. *S. transvaalensis*

8a Spikes with glomerules of florets reflexed at maturity. Glumes densely hairy with reddish black or purplish black hairs 9
8b Spikes with glomerules of florets not reflexed at maturity. Glumes glabrous or hairy but hairs not reddish black or purplish black [except that occasionally hairs of *S. dieterlenii* (No. 5) reddish brown, but plants montane only] 10

9a Rhizome at least 2 mm thick, woody, ± horizontal and elongate. Leaves ± evenly spaced along aerial stems .... 6. *S. distans*
9b Rhizome never woody and elongate, rather short, soft, holding shoots together so plants sometimes appear tufted; 1 to several fleshy soboles may be developed from the culm cluster. Leaves crowded towards bases of aerial stems .. 3. *S. aterrima*

10a Plants annual, lacking evidence of propagative underground stems. Glumes glabrous. Achene grey, strongly tuberculate-verrucose with crests of tubercles lighter grey (once collected near Dundee in 1944) .... 11. *S. pergracilis*
[Note: other plants appearing tufted without obvious development of underground stems should be compared with *S. dregeana* (No. 7) which is extremely variable.]
10b Plants perennial with underground propagative stems taking the form of thickened horizontal rhizomes, OR rhizomes with thickened culm bases, OR rhizomes wholly or partially swollen (soft and tuberous), OR soboles (elongate stems rooting from nodes and bearing reduced scale leaves) 11

11a Rhizome woody, at least 2 mm thick, elongate, ± horizontal OR woody, bearing closely spaced swollen culm bases 12
11b Rhizome not woody, soft and tuberous, wholly or partially swollen, or underground organs elongate soboles 13

12a Rhizome woody, elongate, ± horizontal (at least 2 mm thick). Inflorescence lax, usually drooping, often with glomerules more widely spaced towards base. Spikelets 5–7(–8) mm long. Achenes smooth .... 15. *S. welwitschii*
12b Culm bases thickened, closely spaced on abbreviated woody rhizome. Inflorescence unbranched or with 1 to several basal branches, not lax or drooping. Achenes smooth or lightly or strongly tuberculate or trabeculate (often variable on a single plant) .... 4. *S. bulbifera*

13a Underground organs of perennation soft and tuberous, swollen throughout their length, or only towards their apices 14
13b Underground organs of perennation elongate soboles (sometimes lacking in *S. dregeana* (No. 7) when plants appear tufted and could be interpreted as annual) 15

14a Inflorescence much branched, branches delicate. Glumes glabrous .... 16. *S. woodii*
14b Inflorescence unbranched (rarely with one basal branch). Glumes sparsely to densely villous (Drakensberg only) 5. *S. dieterlenii*

15a Culms often clustered so that plants appear tufted or almost so; if soboles are present these (1 or more) arise from base of culm cluster. Achenes smooth or tuberculate or trabeculate towards apex, smooth at junction of stipe and body (coast to Drakensberg) .... 7. *S. dregeana*
15b Culms usually solitary, widely spaced, linked by trigonous, red-speckled soboles with internodes 8–47 mm long. Achenes undulate-tuberculate, with a series of ranked depressions separated by small ridges at junction of stipe and body (strictly coastal, in sand) .... 13. *S. sobolifer*

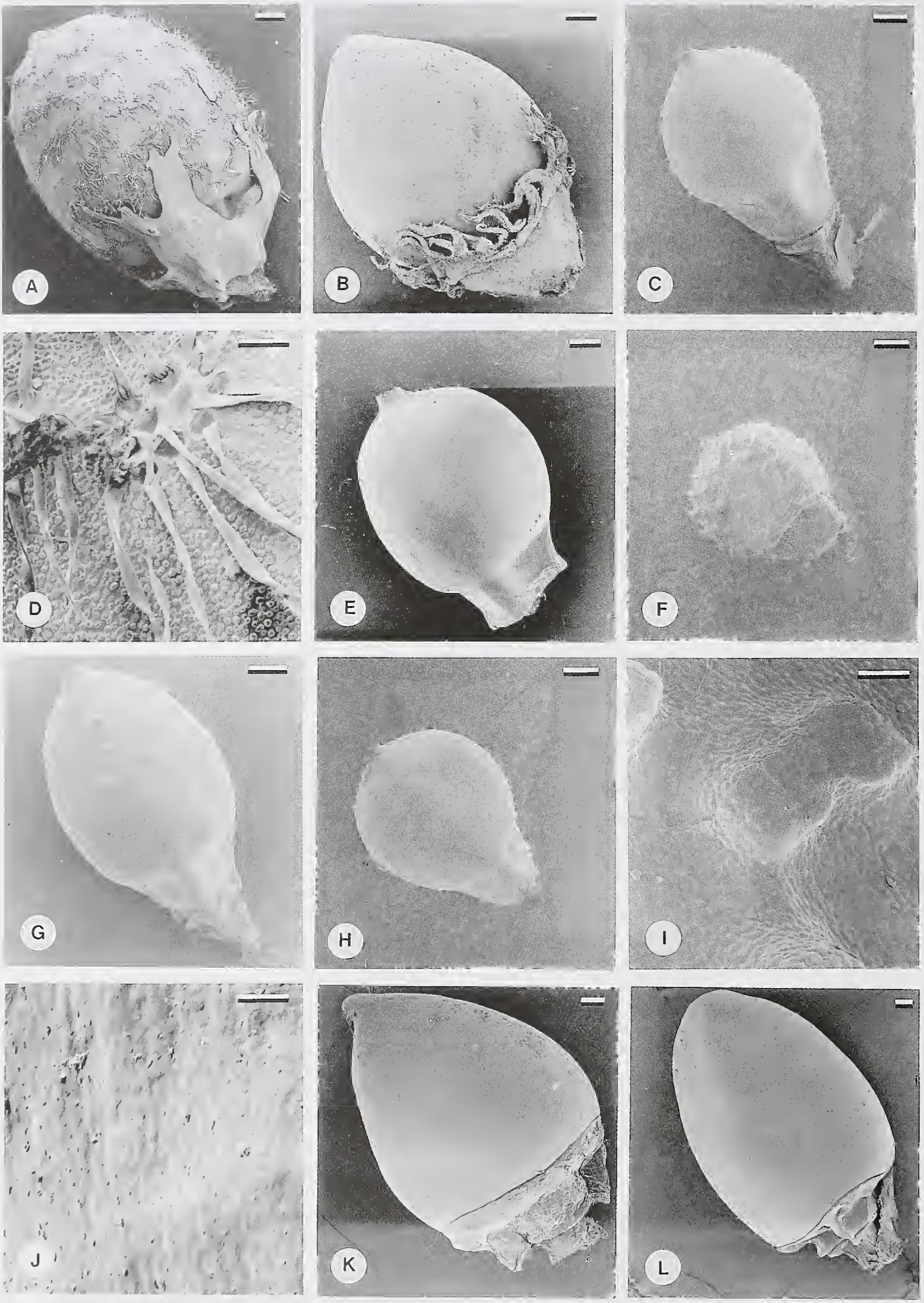

FIGURE 82.—*Scleria*. A, D, *S. achtenii*, *Ward 9146*; B, *S. angusta*, *Taylor 120*; C, *S. aterrima*, *Ward 2924*; E, *S. bulbifera*, *Hilliard & B.L. Burtt 18036*; F, I, *S. dieterlenii*, *Hilliard & B.L. Burtt 15427*; G, J, *S. dregeana*, *Moll 1424*; H, *S. distans*, *Feely & Ward 7*; K, *S. greigiifolia*, *Huntley 781*; L, *S. melanomphala*, *J. Browning 220*. Scale bars: A–C, E–H, 250 µm; D, I, J, 25 µm.

1. **Scleria achtenii** *De Wild.* in Revue zoologique africaine Supplement Botany, 14: 16 (1926); De Wild.: 219 (1927); E.A. Rob.: 534 (1966); E.F. Franklin: 333 (1979); E.F. Franklin: 147 (1981); E.F. Franklin: 465 (1983a); R.W. Haines & Lye: 350 (1983); Hennessy: 526 (1985). Type: Congo, (Zaïre), *Achten 97B* (BR, holo.). Figure 82A, D.

S. substriatoalveolata De Wild.: 23 (1926); De Wild.: 240 (1927). Syntypes: Congo (Zaïre), *Vanderyst 1060, 8190, s.n.* (BR).

S. subintegriloba De Wild.: 238 (1927). *S. achtenii* De Wild. var. *subintegriloba* (De Wild.) Piérart: 47 (1951a). Type: Congo (Zaïre), *Vanderyst 2839* (BR, holo.).

S. nyasensis sensu Nelmes: 86 (1956) p.p. non C.B. Clarke (1901/1902).

Icones: E.F. Franklin: figs 2–10, 11 (achene only) (1979); E.F. Franklin: fig. 20A–C (achene only); figs 562, 563 (photographs of types) (1983a); R.W. Haines & Lye: fig. 725 (1983); Vanden Berghen: 268 (1988).

Vouchers: *Tinley 361; C.J. Ward 5437, 5508, 8887.*

Description: Hennessy: 526 (1985).

Distribution: Coast, Maputaland.

Rhizomatous perennial of open, permanently damp to wet habitats often precursory to forest, where soil is usually a rich loam. Only Natal species with hairy achenes; hairs white to off-white, sometimes sparse, always best represented towards base. Leaf sheaths villous, as also main nerves of abaxial surfaces of blades.

2. **Scleria angusta** *Nees ex Kunth*, Enumeratio plantarum 2: 346 (1837); C.B. Clarke: 296 (1897/98); Nelmes: 73 (1956); E.A. Rob.: 548 (1966); E.F. Franklin: 489 (1983a); Hennessy: 528 (1985). Type: South Africa, *Drège s.n. sub. C.B. Clarke 42246* (B, K, lecto.). Figure 82B.

Icones: E.F. Franklin: figs 4, 24A–D, 564, 565 (1983a).

Vouchers: *Tinley 254; C.J. Ward 717, 1186, 3712, 8083.*

Description: Hennessy: 528 (1985).

Distribution: Coast, Maputaland.

Robust perennial with evergreen aerial parts up to 1 m high, now occasional in water in shade in relict areas of swamp forest along entire Natal coastline and into Transkei. Readily identified by its pleated leaves, some with praemorse apices (Figure 81D), and its smooth whitish mauve to purple achenes each with a fimbriate hypogynium. Its closest relative, *S. racemosa* Poir., with culms up to 3 m long, is not known south of Mozambique.

3. **Scleria aterrima** (*Ridl.*) *Napper* in Kew Bulletin 25: 445 (1971b); E.F. Franklin: 444 (1983a); Hennessy: 522 (1985). Type: Angola, *Welwitsch 7143* (BM, holo.; K, iso.). Figure 82C.

S. hirtella Sw. var. *aterrima* Ridl.: 166 (1884).

S. hirtella Sw. sensu Boeck.: 439 (1874) excl. synon., at least *Barter 1561*. *S. catophylla* C.B. Clarke: 670 (1894b) p.p. excl. synon. Amer.; C.B. Clarke: 294 (1897/98); C.B. Clarke: 498 (1901/02); Hutch.: 491 (1936); E.A. Rob.: 182 (1964); E.A. Rob.: 501 (1966); R.W. Haines & Lye: 329 (1983); Vanden Berghen: 327 (1988). Type: Nigeria, *Barter 1561* (K, holo.).

Icones: E.F. Franklin: figs 566, 567 (1983a); R.W. Haines & Lye: figs 671, 672 (1983); Vanden Berghen: fig. 269 (1988).

Vouchers: *Nicholson 1103; Moll 4729; Strey 10102; Ward 2924.*

Description: Hennessy: 522 (1985).

Distribution: Coast, Maputaland.

Perennial with annual aerial parts, propagating by lateral stems arising underground from bases of culms (soboles) and lacking a woody rhizome which is well developed in the closely allied *S. distans* (No. 6). Care must be taken in distinguishing these two species which may be sympatric. *S. aterrima* is further recognisable by its basally aggregated photosynthetic leaves that in *S. distans* are evenly spaced along culms (lower leaves with blades usually reduced) and by its invariably blackish glume hairs that in *S. distans* are sometimes merely pale or reddish. In Ross (1972), *S. aterrima* was not recorded for Natal. Plants occur in open, permanently wet, sandy areas.

4. **Scleria bulbifera** *Hochst. ex A. Rich.*, Tentamen florae Abyssinicae, 2: 510 (1851); C.B. Clarke: 500 (1901/02); Kük.: 530 (1936/37); Piérart: 24 (1951a); Nelmes: 438 (1955c); E.A. Rob.: 503 (1966): E.F. Franklin: 410 (1983a); R.W. Haines & Lye: 331 (1983); Hennessy: 518 (1985); Hilliard: 62 (1987); Hilliard & B.L. Burtt: 115 (1987). Syntypes: Ethiopia, *Schimper 1557* (BM, K); *Quartin-Dillon & Petit s.n.* (BM, K). Figures 82E; 83.

S. atrosanguinea Hochst. ex Steud.: 175 (1855). Type: Ethiopia, *Schimper 327* (K, holo.; BM, iso.).

S. schweinfurthiana Boeck.: 570 (1879). Type: Sudan, *Schweinfurth 2193* (K, holo.).

S. buchananii Boeck.: 33 (1888). Syntypes: Malawi, *Buchanan 32* (K); 1272 (K).

S. verdickii De Wild.: 26 (1926). Type: Congo, (Zaïre) *Verdick 398* (BR, holo.).

S. schliebenii Gross: 657 (1932). Type: Tanzania, *Schlieben* 782 (B).

S. thomasii Piérart: 405 (1951b). Type: Congo, (Zaïre), *R.L.X. Thomas 1202* (BR, holo.).

Icones: E.F. Franklin: figs 568–573 (1983a); R.W. Haines & Lye: figs 677, 678 (1983); Davis in Hilliard: 62 (1987); Vanden Berghen: fig. 272 (1988).

Vouchers: *Hennessy 407; K.D. Huntley 567; Killick 1579.*

Description: Hennessy: 518 (1985).

Distribution: Midlands, Uplands.

Perennial with annual aerial parts. Common in open grassveld that is dry, seasonally wet or permanently boggy; particularly evident spring to midsummer. Distinguished from all other Natal species, except *S. transvaalensis* (No. 14), by contiguous, swollen, tuberous culm bases. *S. transvaalensis* has similar swollen culm bases, but is known in Natal only from Zululand (Ngoye) and there in semi-shaded, streamside situations. *S. bulbifera* is morphologically variable. Inflorescence glomerate-spicate, simple or branched, with few or many spikelets per glomerule. Achenes may be smooth, tuberculate or trabeculate (sometimes on a single plant). *S. transvaalensis* further differs in its inflorescence of a terminal and lateral panicles and in its larger achene (2.5–3.0 × 2 mm, as opposed to 1.6–2.0 × 1.0–1.8 mm for *S. bulbifera*).

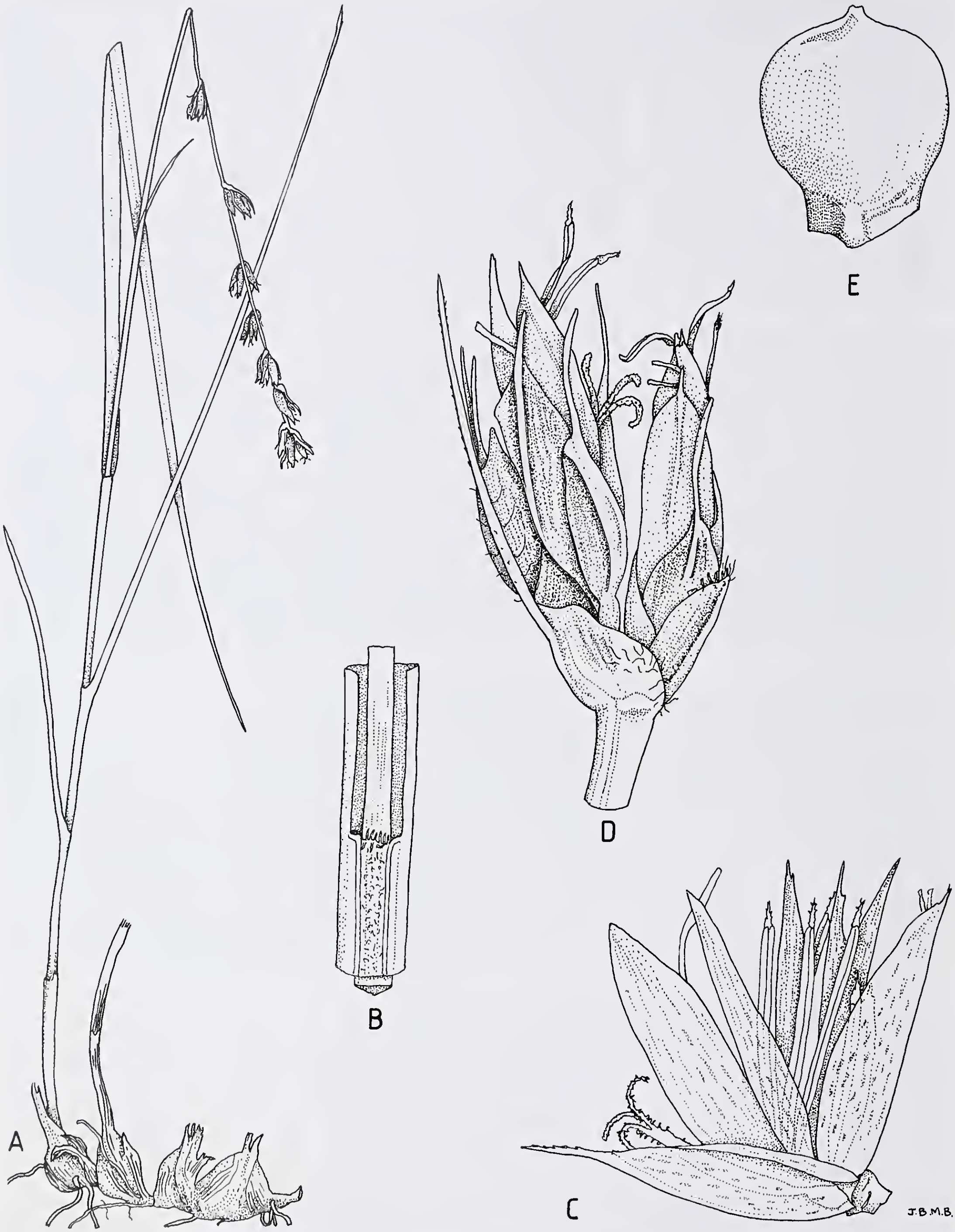

FIGURE 83.—*Scleria bulbifera.* A, plant, × 1; B, portion of leaf and culm at junction of lamina and sheath, × 8; C, androgynous spikelet with lower prophyll and one glume removed, remainder displaced to show lower female floret and upper male florets, × 12; D, glomerule of 3 spikelets, × 11; E, achene, × 18. A–D, *Hilliard & B.L. Burtt 13394*; E, *Hilliard & B.L. Burtt 18036*.

5. **Scleria dieterlenii** *Turrill* in Kew Bulletin 1914: 20 (1914); Nelmes: 441 (1955c); Napper: 443 (1971b); E.F. Franklin: 436 (1983a); Hennessy: 521 (1985); Hilliard: 62 (1987); Hilliard & B.L. Burtt: 115 (1987). Type: Basutoland (Lesotho), *Dieterlen 749* (K, holo.; NH, PRE, iso.). Figure 82F, I.

S. schweinfurthiana sensu Hutch. & Dalz.: 491 (1936) p.p. non Boeck.: 570 (1879). *S. flexuosa* sensu E.A. Rob.: 505 (1966) p.p. non Boeck.: 33 (1888).

Icones: E.F. Franklin: fig. 574 (1983a).

Vouchers: *Bews 471; Hilliard & B.L.Burtt 15140.*

Description: Hennessy: 521 (1985).

Distribution: Midlands, Uplands.

S. dieterlenii (spikelets 4–5 mm long) is closely related to the tropical African species *S. flexuosa* Boeck. (spikelets 5–6 mm long) and *S. lateritica* Nelmes (spikelets 3–4 mm long). Some authorities regard them as synonymous (Robinson 1966; Napper 1971b). If the southern populations are segregated, as is done here, *S. dieterlenii* is known from high elevations in Lesotho, the Transvaal, Natal and the eastern Cape. Plants are perennial with annual aerial organs and grow in seasonal bogs or in shallow, marshy soil over rock sheets. A slender descending subvertical rhizome with a swollen, tuberous tip is often overlooked if not carefully dug. This tuber, like the fleshy rhizome of *S. woodii* (No. 16), shrinks rapidly on exposure due to loss of its volatile content. Other characteristic features are hairy glumes and grey achenes with the crests of the trabeculae suffused reddish brown. Among Natal species the closest affinity is with *S. pergracilis* (No. 11).

6. **Scleria distans** *Poir.* in Encyclopédie méthodique. Botanique. 7: 4 (1806); R.W. Haines & Lye: 330 (1983) as *S. distans* var. *distans*. Type: West Indies, Puerto Rico, *Ledru 110* p.p. (P).

S. nutans Willd. ex Kunth: 351 (1837); E.A. Rob.: 179 (1964); E.A. Rob.: 502 (1966); E.F. Franklin: 439 (1983a); Hennessy: 522 (1985). *Hypoporum nutans* (Willd. ex Kunth) Nees: 170 (1842). Type: Venezuela, Cumana, *Humboldt s.n.* in Herb. Willd. 17336 (B-W).

S. mollis Kunth: 352 (1837). Type: Brazil, *Sellow s.n.* (K).

S. cenchroides Kunth: 352 (1837). Type: South Africa, *Drège s.n.* (K).

S. hirtella Sw. var. *tuberculata* C.B. Clarke: 294 (1897/98); Schönland: 64 (1922). Type: South Africa, *Burke 62* (K).

S. hirtella Sw. var. *chondrocarpa* Nelmes: 451 (1955c). Type: Uganda, *A.S. Thomas 95* (K, holo.).

S. hirtella auct. *permulti* non Sw. (1788).

Icones: Schönland: t. 73 (1922); E.F. Franklin: figs 595, 596 (1983a); R.W. Haines & Lye: figs 673, 674 (1983).

Vouchers: *K.D. Huntley 705; K.D. Gordon-Gray 6182; Killick & Strey 2506; C.J. Ward 5057.*

Description: Hennessy: 522 (1985) as *S. nutans*.

Distribution: Coast, Maputaland.

Perennial with a woody, often long, horizontal rhizome. This organ most clearly distinguishes this species from the similar looking *S. aterrima* (No. 3). Other differences have been summarised under *S. aterrima*. Plants grow in permanently wet areas, usually in sand. Aerial parts annual. There have been differences of opinion as to whether the African and the American plants are conspecific. This is now generally accepted.

Note: Lye in R.W. Haines & Lye (1983) recorded varieties for East Africa, but the range of variability covered (swollen stem bases and wrinkled achenes) is not known for Natal, for which area no infraspecific taxa are recognised.

7. **Scleria dregeana** *Kunth*, Enumeratio plantarum 2: 354 (1837); C.B. Clarke: 295 (1897/98); C.B. Clarke: 499 (1901/02); Nelmes: 426 (1955c); E.A. Rob.: 510 (1966); E.F. Franklin: 421 (1983a); R.W. Haines & Lye: 336 (1983); Hennessy: 519 (1985); Hilliard: 62 (1987); Hilliard & B.L. Burtt: 115 (1987). Type: South Africa, Cap. b. spei, *Drège s.n. sub C.B. Clarke 3934* (B; K, lecto.). Figures 81A–C; 82G, J.

S. meyeriana Kunth: 354 (1837); C.B. Clarke: 294 (1897/98); C.B. Clarke: 498 (1901/02); Nelmes: 431 (1955c). Type: South Africa, Cap. b. spei., *Drège s.n. sub C.B. Clarke 4363* (B).

S. holcoides Kunth: 354 (1837); C.B. Clarke: 296 (1897/98); Nelmes: 427 (1955c). Type: South Africa, *Drège s.n. sub C.B. Clarke* 4381 (B, K, lecto.).

S. caespitosa Welw. ex Ridl.: 167 (1884). Type: Angola, *Welwitsch 7135* (BM, holo.; K, LISU, iso.).

S. setulosa Boeck.: 33 (1888). Type: Malawi, *Buchanan 36* (K, holo.).

Icones: E.F. Franklin: figs 575–577 (1983a); R.W. Haines & Lye: figs 690, 691 (1983).

Vouchers: *Hilliard & B.L. Burtt 13795; K.D. Huntley 425; Moll 1424.*

Description: Hennessy: 519 (1985).

Distribution: Coast, Midlands, Uplands, Zululand. Should be looked for in N Natal.

Perennial with annual aerial parts. Rhizome abbreviated and hardly more developed than is required to hold the contiguous shoots together; plants therefore appear tufted. Propagation also by soboles, but these are not always represented in herbarium specimens. Morphologically the species is variable. '*S. dregeana, S. caespitosa* and *S. setulosa* were based on glabrescent plants with unbranched inflorescences and dark [almost black] glumes; *S. meyeriana* on a very hairy plant with an unbranched inflorescence and pale glumes, and *S. holcoides* on a hairy plant with a branched inflorescence and pale glumes'. (Hennessy 1985). Achenes also variable and may be smooth, or smooth basally, tuberculate in upper half, or trabeculate basally and tuberculate in upper half. Because of this structural range, plants difficult to identify and may be confused especially with *S. sobolifer*, which is confined to the coast and in which the achene is patterned between stipe and body (that of *S. dregeana* smooth in this zone: see fig. 1B–E, Franklin 1983b). Plants occur in open permanent vleis, in marshy ground associated with rock outcrops and along wet streambanks.

8. **Scleria greigiifolia** *(Ridl.) C.B. Clarke* in Flora of tropical Africa 8: 509 (1901/02); J. Kern: 41 (1963); E.A. Rob.: 546 (1966); E.F. Franklin: 484 (1983a); R.W. Haines & Lye: 358 (1983); Hennessy: 527 (1985). Type: Angola, *Welwitsch 6959* (BM, holo.). Figure 82K.

Acriulus greigifolius Ridl.: 336 (1883); Ridl.: 166 (1884); C.B. Clarke: 675 (1894b); Rendle: 132 (1899).

A. madagascariensis Ridl.: 336 (1883); Ridl.: 166 (1884); C.B. Clarke: 676 (1894b); K. Schum.: 128 (1895). *Scleria acriulus* C.B. Clarke: 509 (1901/02); De Wild.: 143 (1916); De Wild.: 5 (1920). Syntypes: Madagascar, *Baron 1870* (K); *Hildebrandt 3571* (K).

A. titan C.B. Clarke: 62 (1908). Type: Congo (Zaïre), *Gentil s.n.* (BR, holo.).

S. acriulus C.B. Clarke forma *leopoldiana* C.B. Clarke ex De Wild.: 221 (1906). Type: Congo (Zaïre), *Gillet 2818* (BR, holo.).

S. friesii Kük.: 9 (1921). Type: Zambia, *Fries 743* (UPS, holo.; K, iso.).

Icones: Ridl.: t. 22, figs 1–7 (1884); E.F. Franklin: figs 580–582 (1983a); R.W. Haines & Lye: figs 744, 745 (1983).

Vouchers: *K.D. Huntley 781; Strey 7251; P.G. Stewart 293.*

Description: Hennessy: 528 (1985).

Distribution: Coast, Maputaland.

Stout perennial with evergreen aerial parts up to 2 m high, growing in permanently wet vleis or in shallow lakes. In Natal, known only from eastern shore of Lake St Lucia and from the south (Mtamvuna Valley). Most easily recognised by: lax, copiously branched panicles; scabrid-margined leaves crowded at bases of culms; upper glumes densely hirsute on adaxial (inner) surfaces; achenes prominently beaked and not black apically. These features, especially the leaf margins, the inflorescence and the achene, distinguish *S. greigiifolia* from the far more frequent *S. melanomphala* (No. 9).

9. **Scleria melanomphala** *Kunth*, Enumeratio plantarum 2: 345 (1837); C.B. Clarke: 296 (1897/98); C.B. Clarke: 506 (1901/02); Schönland: 65 (1922); Piérart: 26 (1951a); Nelmes: 88 (1956); E.A. Rob.: 546 (1966); E.F. Franklin: 473 (1983a); R.W. Haines & Lye: 356 (1983); Hennessy: 526 (1985). Type: South Africa, *Drège s.n. sub C.B. Clarke 4369* (K, lecto; OXF, isolecto.). Figures 81E–G; 82L.

S. macrantha Boeck.: 572 (1879) non *S. macrantha* Boeck. (1859), nom. illegit. Type: Sudan, *Schweinfurth 3746* (K, iso.).

S. longigluma Kük.: 22 (1921). Type: Brazil, *Ule 8066* (B).

S. centralis Cherm.: 50 (1931). Syntypes: Central African Republic, *Le Testu 2436* (P); *Tisserant 1233* (P).

Icones: Schönland: t. 74 (1922); Piérart: t. 1, figs 26, 31 (1951a); E.F. Franklin: figs 592, 593 (1983a); R.W. Haines & Lye: figs 741, 742 (1983).

Vouchers: *K.D. Gordon-Gray 6188, 6217; C.J. Ward 724, 2856, 7708, 8837.*

Description: Hennessy: 527 (1985).

Distribution: Coast, Zululand, Maputaland.

Robust, evergreen perennial often growing in fairly extensive stands in permanently wet, usually fairly open habitats. Most easily recognised by: smooth-margined leaves (7–20 mm wide) evenly spaced along culms; very compact spiciform panicles with glumes red-brown or blackish red; and smooth, beakless, usually black-tipped achenes.

10. **Scleria natalensis** *C.B. Clarke* in Flora capensis 7: 296 (1897/98) p.p.; Nelmes: 88 (1956) p.p. non C.B. Clarke (1894b p.p.; 1897/98 p.p.); E.F. Franklin: 454 (1983a); E.F. Franklin: 35 (1983b); Hennessy: 523 (1985). Type: South Africa, Natal, *Buchanan 352* (K, holo.; NH, iso.). Figure 84A, D.

Icones: E.F. Franklin: fig. 594 (1983a); Hennessy: fig. 10 (1985).

Vouchers: *Venter 733; Strey 9464; C.J. Ward 4935, 8741.*

Description: Hennessy: 523 (1985).

Distribution: Coast, Zululand, Maputaland.

Evergreen perennial endemic to Natal and Transkei. Plants grow usually in local, almost pure stands in semi-shade in wet or seasonally moist (often seepage) areas. The species has a more southerly distribution than *S. transvaalensis* (No. 14), the two being sympatric only in the vicinity of Ngoye Forest near Empangeni. There should be no confusion between them as *S. natalensis* has culm bases that are not swollen; leaves and bracts 3–4 mm wide approximately 10 mm behind their apices; dull straw-coloured glumes and subglobose, obtusely trigonous achenes.

11. **Scleria pergracilis** *(Nees) Kunth*, Enumeratio plantarum 2: 354 (1837); C.B. Clarke: 495 (1901/02); Piérart: 20 (1951a); Nelmes: 445 (1955c); E.A. Rob.: 494 (1966); E.F. Franklin 433 (1983a); R.W. Haines & Lye: 342 (1983); Hennessy: 521 (1985). Type: India, Silhet, *Wallich 3406* (K, holo.). Figure 84B, E.

Hypoporum pergracile Nees: 267 (1834c).

S. pergracilis (Nees) Kunth var. *brachystachys* Nelmes: 446 (1955c); Napper: 31 (1964); E.A. Rob.: 494 (1966). Type: Zimbabwe, *Brain 3710* (K, holo.; PRE, SRGH, iso.).

Icones: E.F. Franklin: fig. 597 (1983a); R.W. Haines & Lye: figs 705, 706 (1983); Vanden Berghen: fig. 286 (1988).

Voucher: *Pentz & Acocks 10277.*

Description: Hennessy: 521 (1985).

Distribution: northern Natal.

Scleria pergracilis was once collected near Dundee in 1944. It is probable that since this date the habitat (open seasonal vlei) has been modified, if not entirely destroyed. However, this slender annual should still be sought in similar situations both in Natal and over the Natal/ Transvaal border.

Widely distributed in tropical Africa, but again, never common; nor adequately known. Nelmes (1955c) established within it var. *brachystachys* (to which he referred the Natal gathering). Robinson (1966) expressed uncertainty about the validity of this variety and mentioned the existence of intermediates impossible to place with confidence either as typical or as representative of plants with shorter denser spikes (var. *brachystachys*). Further consideration of the species in Natal must await its rediscovery in the field.

12. **Scleria poiformis** *(poaeformis) Retz.*, Observationes botanicae 4: 13 (1786/87); Kunth: 358 (1837); Steud.: 179 (1855); C.E.C. Fisch.: 265 (1931a); Nelmes: 110 (1956); E.A. Rob.: 547 (1966); E.F. Franklin: 480 (1983a); R.W. Haines & Lye: 357 (1983); Hennessy: 527 (1985). Type: India Or., *Koenig s.n.* (LD, holo.; LZ, K,

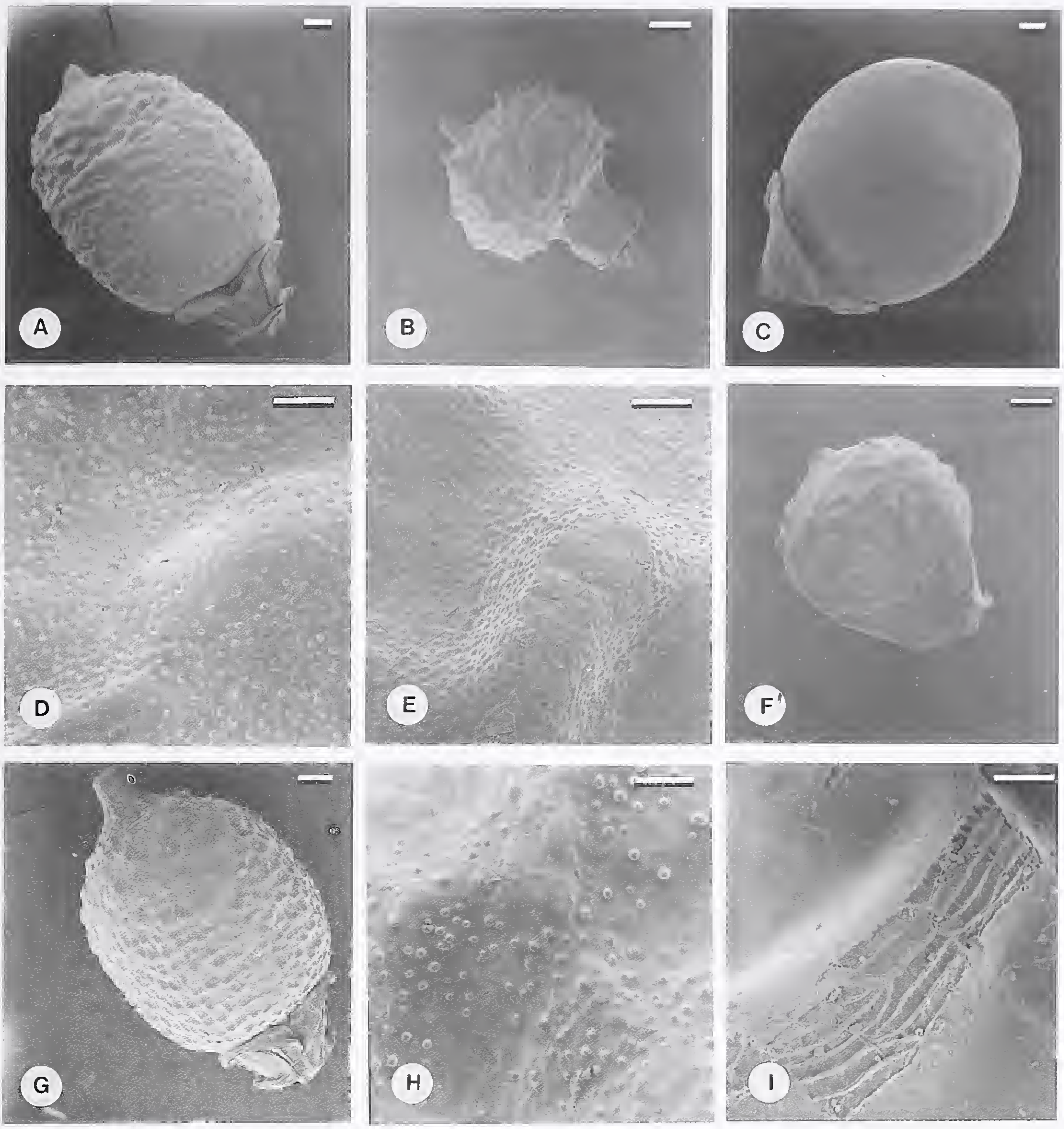

FIGURE 84.—*Scleria*. A, D, *S. natalensis, K.D. Gordon-Gray s.n.*; B, E, *S. pergracilis, Robinson 1181*; C, *S. poiformis, Ward 4024*; F, I, *S. sobolifer, Ward 2784*; I, showing patterning of stipe; G, H, *S. transvaalensis, Seagrief 18*. Scale bars: A–C, F, G, 250 µm; D, E, H, I, 25 µm.

iso.) (T. Koyama, 1985, states the type is ‘probably from Ceylon’). Figure 84C.

Scleria oryzoides C. Presl: 201 (1828); Nees: 116 (1834a); Kunth: 356 (1837); Steud.: 169 (1855); C.B. Clarke: 101 (1897/98); C.B. Clarke: 505 (1901/02). Type: Phillipines, Luzon, *Haenke s.n.* (PR, holo.; K, iso.).

Icones: J. Kern: fig. 108 (1974); E.F. Franklin: fig. 598 (1983a); R.W. Haines & Lye fig. 743 (1983).

Vouchers: *Hennessy 373; Pooley 2340; Strey 8199; Taylor 218; C.J. Ward 4024.*

Description: Hennessy: 527 (1985).

Distribution: Maputaland.

S. poiformis will not readily be confused with any other Natal species. The robust, aquatic, rhizomatous, evergreen perennial plants up to 1.5–2.0 m tall grow in almost pure stands in open habitats in shallow lakes in coastal pans. Basal crowded leaves (20–40 mm wide) and handsome terminal panicle (usually without bracts) make the species conspicuous. Koyama (1985) likens the panicle to the inflorescence of *Sorghum* (Poaceae).

13. **Scleria sobolifer** *E.F. Franklin* in Kew Bulletin 38: 33 (1983b); E.F. Franklin: 428 (1983a); Hennessy: 521 (1985). Type: South Africa, Natal, *C.J. Ward 5128* (K, holo.; PRE, NH, NU, UDW, iso.). Figure 84F, I.

Icones: E.F. Franklin: fig. 600 (1983a); E.F. Franklin: t. 3A–E, fig. 1A (1983b); Hennessy: fig. 6 (1985).

Vouchers: *T.H. Arnold 467; Baijnath 126; Strey 5136; C.J. Ward 723, 5128, 5470.*

Description: Hennessy: 521 (1985).

Distribution: Coast, Maputaland.

Perennial with annual straggling culms and unbranched glomerate-spicate inflorescence. Endemic to Natal including Maputaland coast, frequent in organically enriched sand. Occurs near margins of disturbed areas of wet forest and in other similar areas that, because of their very limited extent, cannot now be interpreted as 'swamp forest'. Both *S. sobolifer* and *S. dregeana* produce soboles (accompanied by an abbreviated rhizome in the latter, but never in the former), but it may be difficult to distinguish these species on the basis of underground organs alone. Mature achenes should always be checked. Those of *S. sobolifer* possess patterning between stipe and body: those of *S. dregeana* are unornamented (smooth) in this zone (see Figures 82, 84.; E.F. Franklin 1983b: fig. 1).

In Ross (1972) this species was listed as 13. sp. undescribed.

14. **Scleria transvaalensis** *E.F. Franklin* in Kew Bulletin 38: 35 (1983b); E.F. Franklin: 451 (1983a); Hennessy: 523 (1985). Type: South Africa, Transvaal, *T.H. Arnold 336* (K, holo.; PRE, iso.). Figure 84G, H.

Icones: E.F. Franklin: fig. 601 (1983a); E.F. Franklin: t. 4A–E (1983b).

Vouchers: *Seagrief 18, 23.*

Description: Hennessy: 523 (1985).

Distribution: Zululand (Ngoye Forest).

S. transvaalensis, as its name implies, is more frequent further north. In Natal it has been recorded only from a damp streamside in the semi-shade of a forest glade where it grew in association with *S. natalensis* (No. 10). In Ross (1972) it was not differentiated from the latter species, with which it has features in common. It differs in that its culm bases are tuberous and swollen (not as pronouncedly as in *Scleria bulbifera* (No. 4), but resembling those bases rather than the scarcely enlarged ones of *S. natalensis*). It also differs from *S. natalensis* in that its leaf and bract apices are subulate and 1–2 mm wide approximately 10 mm behind their tips (ensiform and 3–4 mm wide in *S. natalensis*). Plants have annual aerial organs; in the Transvaal culms with old inflorescences may be found standing (dead) during winter.

15. **Scleria welwitschii** *C.B. Clarke* in Conspectus florae africae 5: 675 (1894b) name only; C.B. Clarke: 501 (1901/02); Nelmes: 423 (1955c); E.A. Rob.: 506 (1966); E.F. Franklin: 401 (1983a); R.W. Haines & Lye: 334 (1983); Hennessy: 517 (1985); Hilliard: 62 (1987); Hilliard & B.L. Burtt: 115 (1987). Type: Angola, *Welwitsch 7138* (BM, lecto.). Figure 85A.

S. junciformis Welw. in Ridl.: 168 (1884), nom. illegit. non Thwaites (1864).

Icones: E.F. Franklin: fig. 604 (1983a); R.W. Haines & Lye: fig. 686 (1983).

Vouchers: *Acocks 22049; Edwards 1127; Getliffe 1268; I'Ons 9/83; Killick 1233.*

Description: Hennessy: 517 (1985).

Distribution: Kokstad, south Coast, Midlands, Uplands.

Perennial with woody, ± horizontal rhizome (2–)3–4 mm in diameter and annual aerial parts. Grows in wet or very damp grassland and vleis and, in upland areas, sympatric with plants of *S. dregeana* (No. 7). The well-developed rhizome of *S. welwitschii* serves as the most reliable means of distinction when observable. When underground organs are not represented, the lax inflorescences that branch from the lower glomerules, which are widely spaced along the main axis, usually indicate this species. Spaces between glomerules not uniform: proximally longer than for most species; but gradual reduction distally until closely placed towards tip of axis. Young inflorescences may be misleading since elongation is not complete.

16. **Scleria woodii** *C.B. Clarke* in Flora capensis 7: 295 (1897/98); C.B. Clarke: 501 (1901/02); Nelmes: 428 (1955c); Napper: 443 (1971b) non E.A. Rob. (1966) [*S. woodii* sensu E.A. Rob.: 512 (1966) p.p.]; E.F. Franklin: 396 (1983a); R.W. Haines & Lye: 336 as var. *woodii* (1983); Hennessy: 516 (1985); Hilliard: 62 (1987). Type: South Africa, Zululand, *Wood 3994* (K, lecto.; BOL, NH, iso.). Figure 85B.

Icones: E.F. Franklin: fig. 605 (1983a); R.W. Haines & Lye: fig. 693 (1983) (achene).

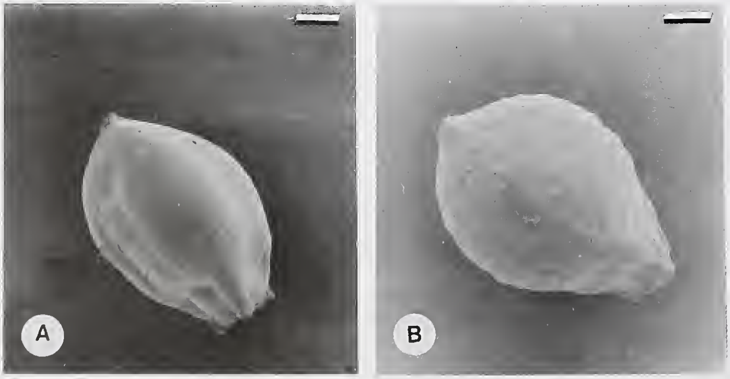

FIGURE 85.—*Scleria*. A, *S. welwitschii*, *Edwards 1127*; B, *S. woodii*, *Edwards 2405*. Scale bars: A, B, 250 µm.

Vouchers: *Frankish & K.D. Gordon-Gray 1/57MK; K.D.Gordon-Gray 2050; Killick 1222, 1254; C.J. Ward 8738.*

Description: Hennessy: 516 (1985).

Distribution: widespread (except lower south coast).

S. woodii perennates by means of a single, obliquely descending, soft tuberous rhizome from each plant that produces a new plant up to 100 mm from the parent, which subsequently dies (Robinson 1966). Tuber highly scented and pearly white or pink on removal from ground, but shrinks and browns rapidly due to loss of its volatile components and oxidation. Tubers often completely missed by collectors; then most readily recognised by the dainty, often profusely branched, inflorescence. Grows in damp vlei areas of grassland that are not waterlogged for too long or in semi-shade under trees.

0494000 **TETRARIA**

Tetraria, together with the allied genera *Costularia* and *Macrochaetium**, present an especial problem in relation to the Natal flora.

Tetraria was established by Beauvois (1814) to accommodate a type species with a supposed numerical constancy in floral parts (multiples of four) that has proved non-existent (Levyns 1947). With improved knowledge, the considerable variability exhibited by southern African species has become evident, so that Steudel's genus *Macrochaetium* (1855) and Clarke's *Costularia* (1897/98) are now doubtfully distinct from *Tetraria*. *Macrochaetium* comprises only two described species both from the southern Cape: *Costularia* is larger with about eleven species represented in southeastern and tropical Africa, Madagascar and Australia. Koyama (1961) believed observed differences were insufficient for discrimination and so absorbed *Costularia* as congeneric with *Tetraria*. This is the arrangement followed by Reid (1985) and it will be adopted here (*Costularia natalensis* is the only species affected). There is, however, a plant collected by Moll in Maputaland that in Ross (1972) was listed as *Macrochaetium hexandrum* (Nees) Pfeiffer since it possessed six stamens and a shortly hairy, persistent style base. But Moll's plant does not agree in all aspects with Cape representatives of that taxon. It may prove to be an undescribed species of *Macrochaetium* if this genus is maintained, or it may be placed more accurately within *Tetraria*.

Considering the poor representation of *Tetraria*, *Macrochaetium* and *Costularia* in Natal both in number of species and in frequency of distribution, and bearing in mind the great need for re-evaluation of the whole complex, it is simplest and least controversial in this work to place in *Tetraria* all Natal plants that qualify for affinity with this genus. Some of the entities are very inadequately known, so this arrangement is tentative.

Evidence is accumulating that within *Tetraria* a degree of separation of the sexes is taking place. Plants of *T. cuspidata* are sometimes entirely male (Levyns 1947; pers. obs.) and this seems to occur occasionally within other species also, but confirmation is needed.

Tetraria *P. Beauv.* in Mémoires de la classe des sciences mathématiques et physiques de l'Institut de France 1812/13, part 2: 54 (1814); C.B. Clarke: 275 (1897/98); Schönland: 58 (1922); Levyns: 73 (1947); R.A. Dyer: 887 (1976); R.W. Haines & Lye: 320 (1983). Type species: (*T. thuarii* P. Beauv.).

T. compar (L.) T. Lestib., Levyns: 77 (1947).

Key to species

1a Basal leaf sheaths flat or flattish, broad at base tapering upward, usually distinctly veined, extending into blades without development of ligules; dark brown, occasionally pallid 2

1b Basal leaf sheaths rounded, smooth, not distinctly veined, either tubular and closed, OR open but with margins closely folded over one another, with a ligule developed at junction of each sheath and blade; sheaths deep blackish red OR pallid and suffused basally with this colour 5

2a Spikelets 10–15 mm long, more or less individually placed rather than clustered on inflorescence branches; markedly compressed with lower sterile glumes distichous. Style branches 5–7. (Uplands 1 800–2 160 m) .... 2. *T. macowaniana*

2b Spikelets not longer than 10 mm, clustered rather than individually placed on inflorescence branches; not markedly compressed, lower sterile glumes spiralled rather than distichous. Style branches usually 3 (not known from Uplands) 3

3a Functional achene with persistent style base rounded in outline, smooth. Stamens usually 3 per floret. Hypogynous bristles 6–10, stiff not flexuous, with upward-pointing small marginal cilia (difficult to detect if specimen is wet) .... 4. *T. robusta*

3b Functional achene with persistent style base pyramidal in outline, sometimes 3-angled, hairy or scabrid. Stamens 6 per floret (if 3 only, then 'panicle' obviously branched with many spikelets and hypogynous bristles long, soft, flexuous with upward-pointing hairs especially distally) 4

4a Stamens 3 per floret. Hypogynous bristles usually much longer than mature achene, 5 or 6 per floret, soft, flexuous with upward-pointing hairs especially distally. Rudimentary floret situated below bisexual one, but spatial relationship is very close. Panicle with well-developed branches densely provided with spikelets .... 3. *T. natalensis*

4b Stamens 6 per floret. Hypogynous bristles shorter than mature achene, in two ranks of 3, basally scale-like narrowed above, stiff not flexuous, with small upward-pointing marginal cilia (difficult to detect if specimen is wet). Uppermost floret rudimentary, bisexual one below. Panicle with relatively few branches lying close against main axis, spikelets not very numerous .... 5. *Tetraria* sp. A

5a Culms without nodes between basal leaf sheath and inflorescence. Basal sheaths deep blackish red, open but with margins folded over one another. Florets lacking hypogynous bristles 6

5b Culm with at least one node between basal leaf sheath and inflorescence. Basal sheaths green to pallid, suffused blackish red only basally, tubular, closed by membranous tissue. Florets with hypogynous bristles .... 6. *Tetraria* sp. B.

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* See addendum.

6a Spikelets 1-flowered, floret bisexual or male. Leaf blade adjacent to ligule flat with margins scabrid; total leaf length approximately half culm length, blades often curved not erect. Uplands .... 1. *T. cuspidata*
6b Spikelets 1-flowered, floret bisexual or male. Leaf blade adjacent to ligule almost terete (at least strongly curved) with smooth margins; total leaf length equalling or exceeding culm length, blades straight, erect. Coast .. 1a. Variant cf. *T. cuspidata*
6c Spikelets 1- or 2-flowered, either both florets bisexual or pistil of one rudimentary. Glumes either all acuminate or some spikelets with lower glumes acuminate, upper acute. Plants mostly taller than for contrasts 6a and 6b, but sometimes more delicate and finer (not shorter). Lower south coast .... 1b. Variant cf. *T. cuspidata*

1. **Tetraria cuspidata** (*Rottb.*) *C.B. Clarke* in Conspectus florae africae 5: 660 (1894b); C.B. Clarke: 277 (1897/98); Schönland: 59 (1922); Levyns: 83 (1947); Hilliard & B.L. Burtt: 115 (1987) s.l.; Hilliard: 60 (1987). Type: Iconotype Rottb.: t. 18, fig. 3 (1773). Figures 86; 87A, D.

Schoenus cuspidatus Rottb.: 66 (1773); Thunb.: 16 (1794); Thunb.: 92 (1807). *Chaetospora cuspidata* Nees: 298 (1834b); Nees: 188 (1835). *Elynanthus cuspidatus* Nees: 298 (1834b); Nees: 188 (1835). *E. gracilis* Nees: 298 (1834b); Nees: 189 (1835).

E. loreus Nees: 298 (1834b); Nees: 189 (1835). *Tetraria cuspidata* (Rottb.) C.B. Clarke var. *lorea* C.B. Clarke: 660 (1894b); C.B. Clarke: 278 (1897/98); Schönland: 60 (1922). Type: syntypes (?) Cape, precise locality unknown, *Drège 7378*; Vanstadens Mountains, *Zeyher 4430*.

Icones: Rottb.: t. 18, fig. 3 (1773); C.B. Clarke: t. 89, figs 5–8 (1909); Schönland: t. 66 (1922); Levyns: figs 1A, 2A, 3A, B (1947).

Vouchers: Uplands: *Esterhuysen 8847; Hilliard & B.L. Burtt 15712, 17231; Trauseld 799.* Variant 1a Coast: *K.D. Gordon-Gray 6216; K.D. Huntley 785; Strey 5488; C.J. Ward 2761, 5064, 6648.* Variant 1b Lower south coast (Mtamvuna Forest Reserve): *Ward 7176, 7180.*

Description: Levyns: 83 (1947).

Distribution: Uplands, Coast, Uplands.

T. cuspidata is treated here in the broad sense. It is a difficult taxon (species or complex?) requiring detailed study throughout its distributional area and during several seasons. Its morphological variability is perhaps based in ecotypic plasticity and a partial separation of the sexes. Early workers (Clarke 1897/98; Schönland 1922) were unable to order taxonomically the range of forms encountered; Levyns (1947) expressed the opinion that '*T. cuspidata sensu* C.B. Clarke is clearly a group of species the separation of which presents innumerable difficulties'. In the same article she described seven species distinct from *T. cuspidata* that represent '... those forms which field experience, extending over more than ten years, has shown to be distinct in several definite characteristics, both morphological and ecological'.

In Natal *T. cuspidata s.l.* has two main areas of distribution: Uplands where plants occur from approximately 1 500–2 500 m and grow in sparse grassland, often among rocks and mostly in sandstone derived soils; and Coast, from Maputaland to the southern border, in grassland, again mainly in sandy soils.

Upland plants relate reasonably well to characters recognized as diagnostic for Cape plants of *T. cuspidata s.s.* by Levyns (1947) and there seems no significant reason (at this stage of knowledge) not to accept them as falling within the limits of this species.

The coast plants (Variant 1a) are taller and coarser with leaves as long as the culms and straight (half culm length and curved in upland specimens). They also exhibit greater floristic variability. This is expressed in the degree of attenuation of bracts and glumes into aristate apices (var. *lorea*, C.B. Clarke 1897/98); the extent of swelling of the persistent style base and, probably most importantly, the number of florets per spikelet, their structure and sexual function. In how far this variability (especially bract and glume attenuation) is influenced by attack by a smut fungus (frequent at the coast, less so in the Uplands) which inhibits the production of viable achenes, needs investigation. No Natal coast plants (as presently known) relate convincingly to described species segregated from *T. cuspidata s.s.* (Levyns 1947) and the question must be asked whether adequate morphological discontinuity for specific delimitation among them and from *T. cuspidata s.s.* does exist. Two sets of variants are recognised here (see key to species): the first (Variant 1a) represents the majority of coast plants; the second (Variant 1b) two gatherings from the lower south coast, that may or may not represent distinct population entities. Further investigation is needed.

T. cuspidata s.l. may be readily recognised by dark purple-red to blackish, shining persistent bases of shoots of tufted, rather grass-like perennial plants; bluish green culms nodeless between base and inflorescence, and brown, rather spiky, terminal inflorescence. Spikelets fall almost intact leaving only bracts and small basal glumes on inflorescence branches. This results in older inflorescences having a less dense, more spiky appearance than younger examples.

2. **Tetraria macowaniana** *B.L. Burtt* in Notes from the Royal Botanic Garden Edinburgh 34: 282 (1976); Hilliard & B.L. Burtt: 115 (1987); Hilliard: 60 (1987). Type: Cape, Somerset East, in summo monte Boschberg, 4500 ft, *MacOwan 1864* (Z, holo.; K, iso.). Figure 87B, E.

Chaetospora hexandra Boeck.: 37 (1878) non *Tetraria hexandra* (Nees) Kük. *Tetraria macowanii* C.B. Clarke: 661 (1894b); C.B. Clarke: 290 (1897/98); Schönland: 61 (1922) nom. illegit.

T. robusta (Kunth) C.B. Clarke var. *pauperior* Kük.: 190 (1929) at least as to *Schlechter 10078*.

Icones: C.B. Clarke: t. 93, figs 5–8 (1909); Schönland: t. 69 (1922); Davis in Hilliard: 60 (1987).

Vouchers: *Hilliard & B.L. Burtt 7792, 15589, 18350; Manning, Hilliard & B.L. Burtt 16006.*

Distribution: Uplands.

Rather coarse, tufted perennial with large spikelets so arranged within inflorescence that almost all are clearly defined, hardly clustered. Lowest six glumes usually sterile, distichously arranged so that spikelet base is flattened. This opinion, based on specimens from Natal, contrasts with Schönland's (1922) statement that ' ... the glumes of the spikelet are more distinctly spirally arranged than in other species of *Tetraria*.' (based on specimens from mountains of eastern Cape and Koue Bokkeveld). The species is variable floristically. Schönland (*l.c.*) found a range in floret number within spikelets from different gatherings, also differences in floret structure. Burtt's (1976) examination of a spikelet from the type showed five style branches (in agreement with Schönland's finding for *Flanagan 2303* from near Toise River Station), but in spikelets from Natal specimens six branches were present [as for *Schlechter 10078*, with six to seven style arms according to Burtt (1976)]. Stamen number per floret also

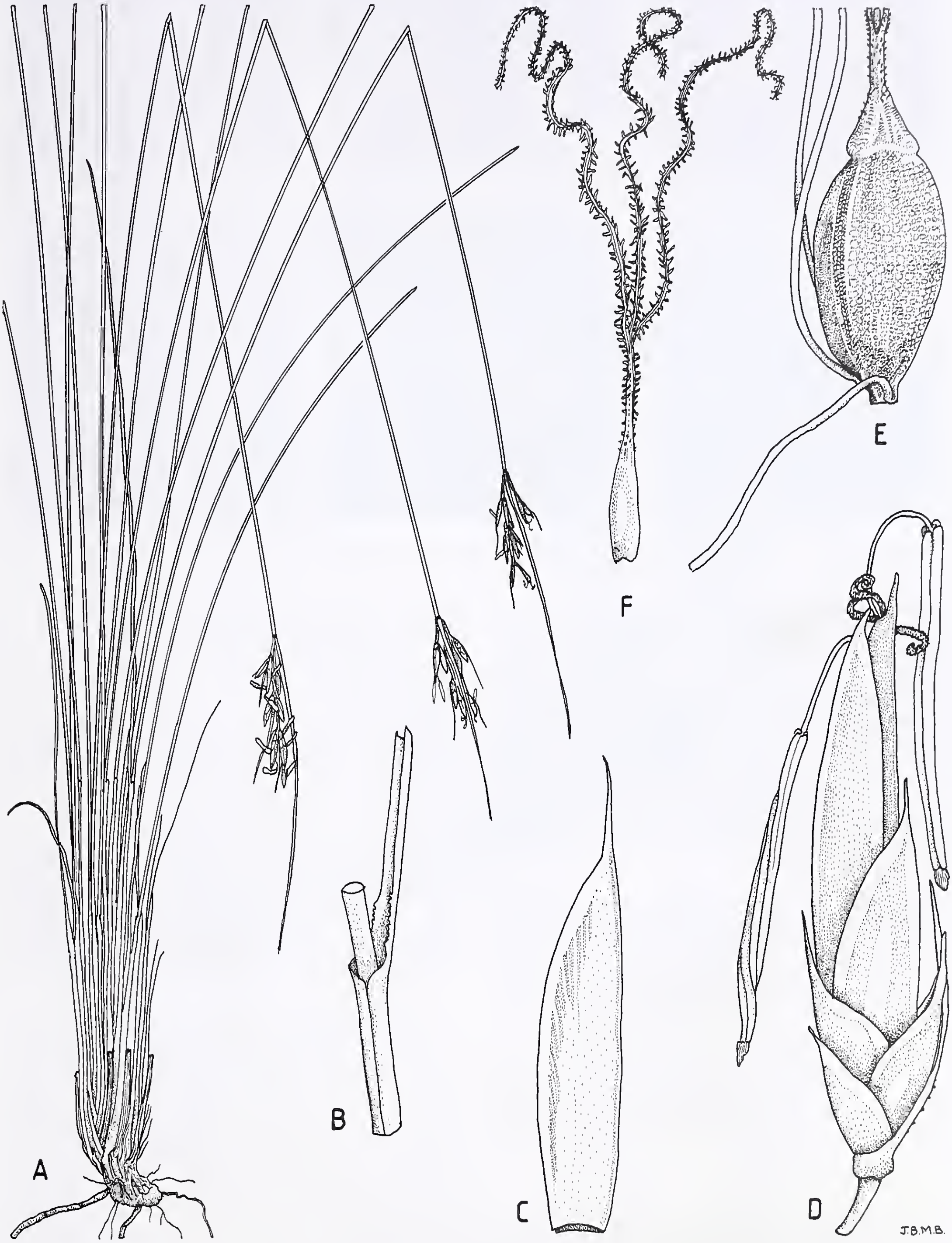

FIGURE 86.—*Tetraria cuspidata.* A, plant, × 1; B, leaf sheath, × 4; C, one of lower sterile glumes, × 20; D, spikelet with one bisexual floret, one stamen shed, × 16; E, achene with swollen style base and three filaments, × 25; F, immature ovary, style and three branches, × 13. A–D, F, *Hilliard & B.L. Burtt 17231*; E, *Hilliard & B.L. Burtt 15712.*

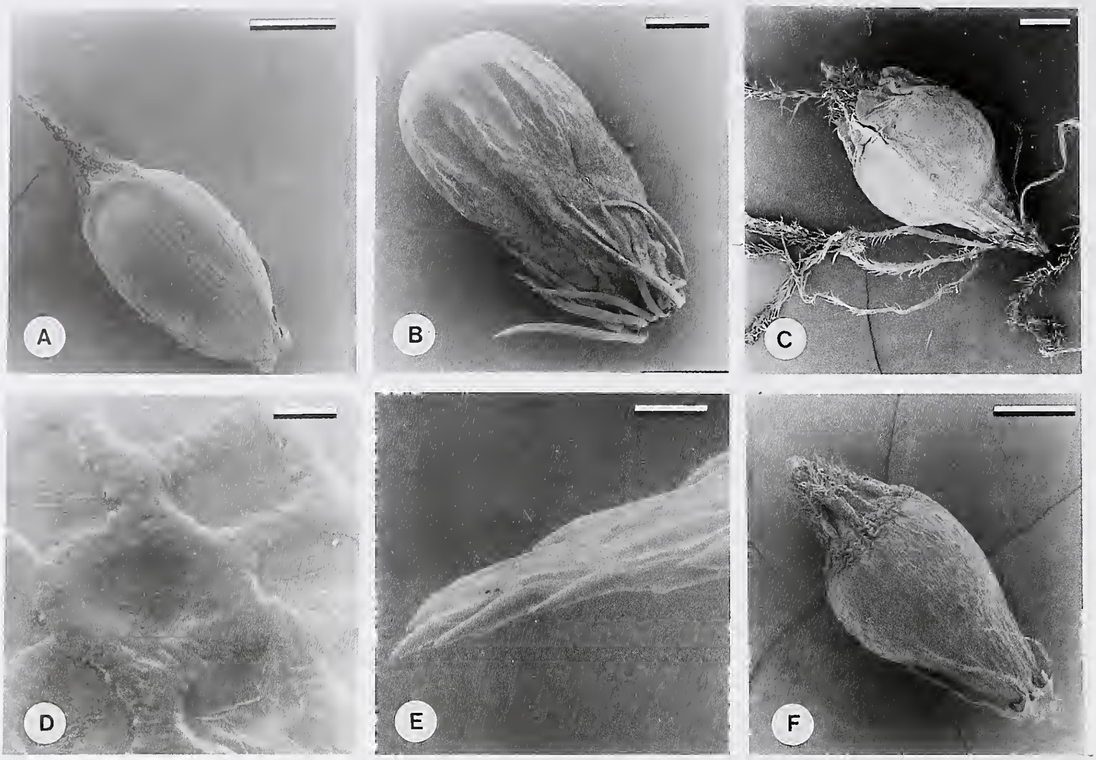

FIGURE 87.—*Tetraria*. A, D, *T. cuspidata, Hilliard & B.L. Burtt 15712*; B, E, *T. macowaniana*; E, apex of bristle, *Hilliard & B.L. Burtt 15589*; C, *T. natalensis, Hilliard & B.L. Burtt 14532*; F, *Tetraria* sp. A, *Moll 4789*. Scale bars: A–C, F, 500 μm; D, E, 25 μm.

varies. Schönland (1922) stated for *Sim 2842* '... stamens were nine or ten, not ripening together.' But there was no indication of how the stamens were distributed between the bisexual and the rudimentary floret of the spikelet. Dissection of a spikelet from *Hilliard & B.L. Burtt 18350* showed seven stamens in the bisexual, three in the rudimentary floret, the two sets not at the same stage of development. Mature anthers apically crested (anther and crest together longer than 5 mm). Hypogynous bristles (up to 10 per floret) stiff, straight and smooth. In no observed case did they exceed the achene in length, but achenes were not fully mature.

There is similarity with *T. robusta* (No. 4) in general facies, but in that species, spikelet size is smaller, the spikelets being more clustered on the inflorescence branches among more numerous, spiky bracts. The smooth persistent style base also shows similarity. However, *T. robusta* is not as floristically variable as its close relative.

T. macowaniana is known in Natal only from the Uplands where plants grow in sparse soil on rock sheets and in bare stony ground. Burtt (Hilliard & Burtt 1987) regards the species as 'rare'. It is more frequent in the eastern Cape.

3. **Tetraria natalensis** *(C.B. Clarke) T. Koyama* in Journal of the Faculty of Science of the University of Tokyo, section 3, 8: 75 (1961). Syntypes: Natal, without stated locality but probably Noodsberg (see Burtt 1988), *Buchanan 152, 354* (K). Figures 87C; 88.

Costularia natalensis C.B. Clarke: 658 (1894b); C.B. Clarke 274 (1897/98); Schönland: 58 (1922); B.L. Burtt: 77 (1988).

Icones: Schönland: t. 64 (1922).

Vouchers: *Alexander s.n.*; *Hilliard & B.L. Burtt 9927, 14504, 14532*; *Rycroft 49*; *Sim 19356*.

Description: C.B. Clarke: 274 (1897/98) as *Costularia natalensis.*

Distribution: Coast, Midlands, Zululand.

Tall, tough perennials growing usually as isolated plants in rough grassland or in remnants of forest margin, frequently among rocks. Basal leaves coarse with scabrid margins and slightly spiralled in arrangement. Burtt (1988) remarks that the species has almost certainly suffered heavily from the planting of grasslands to timber.

As stated in the introductory note to *Tetraria* (p. 187), *T. natalensis* is maintained under the allied genus *Costularia* by some workers because of difference in the positions within the spikelet of the male and the bisexual florets; the more markedly distichous glumes; the slender, flexuous perianth bristles and the more or less rounded (hardly 3-angled) achene with a persistent, scabrid style-base. None of these criteria considered singly, is adequate to distinguish the genera: when taken collectively there is still doubt of generic disjunction. However, collective consideration of the features listed, together with the rather copious, branching inflorescence densely provided with small, dark spikelets, effectively distinguish *T. natalensis* from other Natal species of *Tetraria*. Clarke (1897/98) states that, from their habit, species of *Costularia* have been referred to *Cladium*. In Natal no confusion is possible between *Tetraria natalensis* and *Cladium mariscus* subsp. *jamaicense* since habitats are so distinctive, the latter species occurring only on the coast, in or very close to, water.

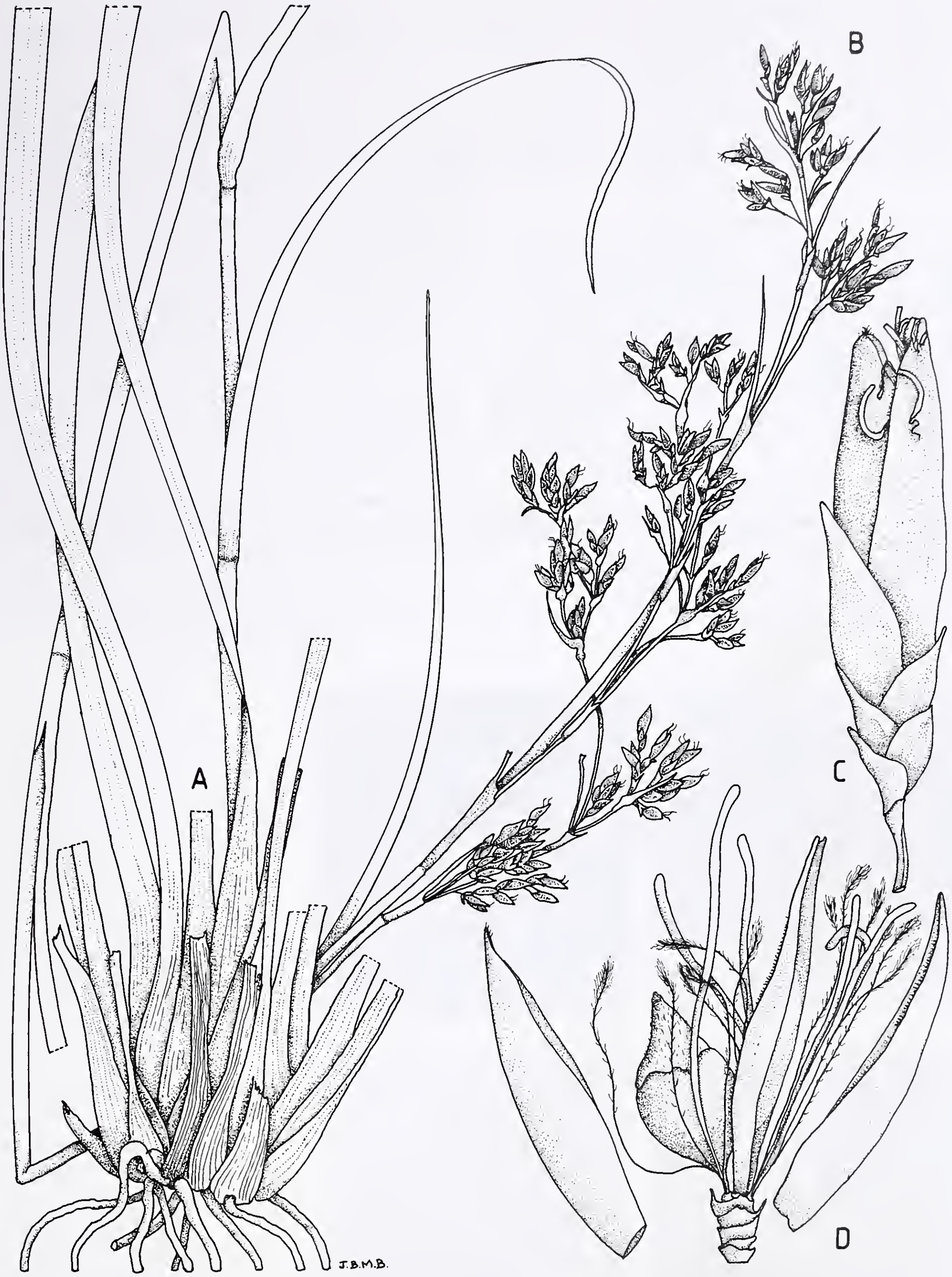

FIGURE 88.—*Tetraria natalensis, Hilliard & B.L. Burtt 14504*. A, plant, × 1; B, inflorescence, × 1; C, spikelet, note basal glumes distichous, × 11.5; D, terminal florets, bisexual and male, with glumes displaced, × 10, note six feathery bristles; three filaments, anthers already shed.

4. **Tetraria robusta** *(Kunth) C.B. Clarke* in Conspectus florae africae 5: 662 (1894b); C.B. Clarke: 285 (1897/98). Type: South Africa, Cape Province, Humansdorp Div., mountains near the Kromme River, *Drège 7375* (K, holo.). Figure 89A, C.

Chaetospora robusta Kunth: 327 (1837).

Vouchers: J. *Browning 328; Van Wyk 5405.*

Description: C.B. Clarke: 285 (1897/98).

Distribution: South Coast (Mtamvuna Nature Reserve).

The close relationship in general facies of *T. robusta* with *T. macowaniana* has already been considered (see No. 2. *T. macowaniana*). There are, however, detailed differences: spikelets of *T. robusta* less markedly flattened with glumes spiral rather than distichous; consistency in number of floral parts for *T. robusta* (3 stamens, 3 style branches in specimens examined) as compared with considerable variation within *T. macowaniana*; hypogynous bristles of *T. robusta* carry minute upward-pointing cilia, whereas those of *T. macowaniana* appear smooth. Fully mature achenes of *T. macowaniana* imperfectly known. They should be compared with the large (± 5 × 3 mm) fruits of *T. robusta* that are brownish, with three rather pronounced cream longitudinal ridges extending vertically downward from smooth, cream, persistent style base (included in achene length above); between these ridges surfaces irregularly wrinkled; base expands into a brown podium, slightly wider than style base from under which bristles arise (Figure 89C).

Plants of *T. robusta*, as the specific epithet implies, are coarse, large, tufted perennials up to about 1 m high. Known in Natal only from one area where plants grow in swampy grassland in sandy soil. Records (not many) are known from eastern Cape coast.

5. **Tetraria** sp. A. Figure 87F. (See also p. 210).

In Ross (1972), *Moll 4789*, from a swamp in Maputaland, was placed under *Macrochaetium hexandrum* (Nees) Pfeiffer because of its spiral glume arrangement, six stamens to the bisexual floret and hairy persistent style base. This meant a discontinuity in distribution between Maputaland and Vanstadens River area that was difficult to accept, but not unique among southern African Cyperaceae. Subsequent investigation has shown Moll's plant to belong to an entity represented by three other specimens from Transkei (*F. Venter & P. Vorster 107; Shackelton 288; S. Venter 843*) and tentatively (because the floral organs are young and it is impossible to be certain), another gathering from Natal *Balkwill & Manning 423* (Mtamvuna Nature Reserve, 4 km upstream). The six stamens set this last gathering apart from *T. robusta* from the same Reserve. Plants also smaller. This now unnamed entity is characterised by the features already mentioned. It differs from *Macrochaetium* in its perianth bristles that are similar to those of *T. robusta* rather than to those of *M. hexandrum* (see note below concerning Schönland's 1922 illustration) and in its achene which is trigonous and quite differently shaped from that of *M. hexandrum*. The bristles are of interest in that they are almost scale-like basally and clearly arranged in two alternating ranks of three.

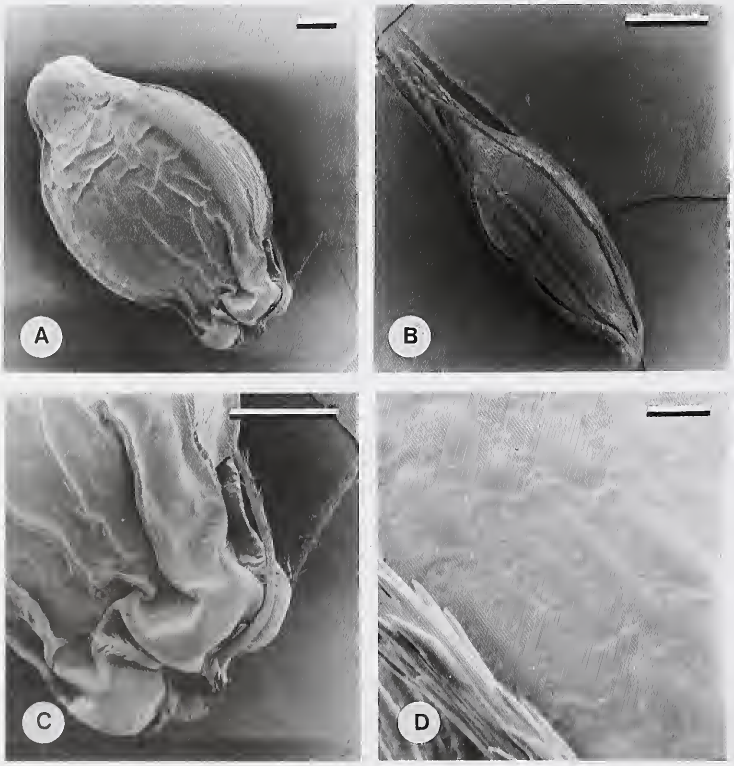

FIGURE 89.—*Tetraria*. A, C, *T. robusta*: C, achene base, note bristles, *J. Browning 328*. B, D, *Tetraria* sp.: B, *Killick 1596*. Scale bars: A–C, 500 µm; D, 25 µm.

The need for revision of the complex represented by *Tetraria, Costularia, Macrochaetium* has already been stated (see pg. ??). Until this is complete and the status and relationships of the three genera and their species decided, it seems most satisfactory to maintain the present entity as an unnamed species under *Tetraria*.

Vouchers: *Balkwill & Manning 423 (?); Moll 4789.*

Distribution: Maputaland; lower South Coast (?).

Note: Schönland's (1922) illustration of [*Macrochaetium dregei* C.B. Clarke = *M. hexandrum* (fig. 70)] is said to be based on *MacOwan 1954*, which gathering neither Schönland himself, nor Clarke (1897/98), cited as this species. There must have been some mistake as *MacOwan 1954* is given again as the specimen on which the illustration of *Tetraria cuspidata* (fig. 66) is based. It must belong with this latter taxon as it is cited by Schönland as having been seen by him. The bristles are not a good representation of those of *Macrochaetium hexandrum.*

6. **Tetraria sp. B**. Figure 89B, D. (See also p. 210).

This species is based upon one gathering only (*Killick 1596*) from the Uplands. It is distinguished from other Natal taxa on the criteria given in the following brief synopsis.

Perennial. Rhizome sympodial, contracted; scale leaves closely-packed, suffused blackish red. Culms numerous, slender, erect 450–500 mm high, 1–3 nodose. Leaves cauline, fine, numerous, longer than culm; sheaths closed, tubular, ligulate; blades channelled adaxially. Inflorescence a slender panicle formed of branches from successive stem nodes. Spikelets peduncled, 7–8 mm long, flattened, mid-brown. Glumes distichous, lowest 4 sterile, next 2 fertile, upper reduced, at least one bearing a rudimentary floret. Hypogynous bristles 6 per floret, with upward-pointing hairs. Stamens 3, anthers crested. Style base not expanded; style arms 3–4. Mature achene trigonous with 3 longitudinal ridges; surfaces between ridges faintly cellular, white.

Killick 1596 cannot yet be accepted as a new species as it has not been compared with all Cape taxa. It grew on the moist floor of a cave in the Inhlawasine River Valley, Cathedral Peak Forest Station where it was 'frequent'. Its achene is not unlike that of *Tetraria cuspidata* (No. 1), but there the relationship seems to end. The closest affinities of Killick's plant are not known. They are not with other Natal species.

Voucher: *Killick 1596.*

Distribution: Uplands (Cathedral Peak).

Acknowledgements

A work of the nature of this book is the outcome of knowledge gradually accumulated. It is the result of the labours of many people, not only in the geographical area covered, but throughout the world, and not only recently but from the time the nature of the sedges was first understood.

It has been my pleasure to attempt to document what is known of Cyperaceae as they occur naturally and as introductions in Natal and to provide means whereby they may be identified and named. In so doing, I have had the benefit of what has gone before, early and late.

Within recent years there have been studies on a number of genera as they are represented in southern Africa, namely, *Carex* (Reid); *Carpha* (Reid & Arnold); *Cyperus* (Baijnath); *Ficinia* (Arnold); *Fimbristylis* (Frankish); *Fuirena* (Forbes); *Isolepis, Ficinia* (Burtt); *Kyllinga* (Getliffe); *Mariscus* (Vorster); *Rhynchospora* (Van Laren); *Schoenoplectus* (Browning); *Schoenoxiphium* (Kukkonen); *Scleria* (Hennessy). These investigations have added abundantly to the information available to me.

I acknowledge, too, my commitment to those who have covered difficult field terrain, taking detailed note while amassing specimens that have permitted more conclusive knowledge of so many aspects of these plants. I thank particularly Mr C.J. (Roddy) Ward from whom I have learned continuously. I also owe thanks to Mr E.A. Robinson, whose collections and field knowledge taught me to realise the significance of Cyperaceae in the vegetation of tropical sub-Saharan Africa.

Nearer home, I thank those who have made publication possible. Mrs J.B.M. Browning for the meticulous illustrations; all the secretarial work and all her enthusiasm; Mr V.J. Bandu and Mrs P. Donnelly, of the Electron Microscope Unit, University of Natal, Pietermaritzburg, who, with Mrs Browning, prepared the many electron micrographs.

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Pietermaritzburg 1991

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Hybrid catalogue

Instances where hybridisation is suspected are enumerated. Each instance is numbered. The genera have been treated alphabetically; so also the species in a hybrid formula, according to the *International Code of Botanical Nomenclature*. In no case is the direction of a cross known, as all the examples have arisen in nature, frequently under conditions where only natural (not man-made) disturbance of the habitat has taken place. At the end, some notes refer to genera.

Putative hybrid species

H1. *Cyperus articulatus* L. (No. 4) × ? [possibly *C. natalensis* Hochst. (No. 25)]

C.J. Ward 664 from Isipingo, near Durban, has been placed under *Cyperus corymbosus* (No. 6). There are two other Natal gatherings, *Drège 4406* (PRE) and *R.E. & C.T.E. Fries 3247* from Durban (the last has not been seen). These are the only known records of *C. corymbosus* for the area under consideration in a period covering about 150 years. Had the taxon been well established, it is likely more gatherings would exist.

Ward 664 shows affinity with *C. natalensis* in the tuberous rhizome and in the development of elongate inflorescence bracts and occasional leaf blades, whereas the sparsely septate culms and the general morphological facies suggests relationship with *C. articulatus*. In Natal, *C. articulatus* is frequent; so, too, are variants, often with imperfectly developed spikelets. This is suggestive that the species often enters into hybridisation.

The history of *C. corymbosus* is interesting. The species is widespread but, it would seem from the literature, nowhere common. Most authors relate it to *C. articulatus*. Can it be that all known records are derivatives from that species, their variability [Kükenthal (1936), recognised six varieties] the outcome of gene exchange with different allied taxa in different parts of the world? Koyama described *C. corymbosus* for Ceylon as 'Subaphyllous perennial often growing in a large colony;'. He also described *C. articulatus* L. with the note 'It is rather interesting that this species has never been collected since Trimen's time'. Is the hybrid derivative, taking over from one of the parental species?

H2. *Cyperus denudatus* L. f. (No. 9) × ?

Cyperus sphaerospermus Schrad. (No. 41) [= *C. denudatus* L. f. var. *sphaerospermus* (Schrad.) Kük.] has long been associated with *C. denudatus* as the leafy expression of that species, but relationship is not close enough to warrant varietal status. Morphologically the two taxa are distinctive. *C. sphaerospermus* is widespread along the Natal coast where plants show profuse multiplication by growth of vegetative buds from the inflorescence. Achenes are produced, but in small numbers, and it is not known whether these are sexually derived or agamospermic. Again it is not known whether they are capable of germination. If this taxon is of hybrid origin, as seems likely, it has survived for a long period of time judging from its quite wide distribution. It is not recorded for tropical Africa, except perhaps Angola. In Swaziland it grows with *C. denudatus* and *C. deciduus* Boeck.

H3. *Cyperus dives* Delile (No. 12) (= *C. immensus* C.B. Clarke) × *C. papyrus* L. (No. 27)

E.S. Pooley & F. Joubert 1834, collected 20-12-1976, Hlabisa District, on new road to Mfolozi River to start of channel to St. Lucia (artificially dug for drainage purposes).

The hybrid has the stature (± 2.5 m high) and the long inflorescence rays of *C. papyrus*, and at first glance was taken for that species. Other features showing relationship with *C. papyrus* are spikelet size, wings of the spikelet rachilla and glume shape and texture.

Features showing relationship with *C. dives* are the fewer rays of the inflorescence; the structure of the prophyllar sheaths of these rays (tubular and closely investing, with a truncate mouth in *C. papyrus*: tubular, but much looser with an oblique mouth sometimes drawn out into a prolongation, in the hybrid) and the anther connective (with the shape of that of *C. dives*, but longer: in *C. papyrus* this organ is long and differently shaped). The best developed achenes on the hybrid had the shape and dimensions of those of *C. papyrus*, but only few were present, none appearing to reach full maturity.

C. papyrus grows in permanent water; so did the hybrid. Adjacent, in damp marsh drained by a streamlet was a stand of *C. dives*. Through the marsh a channel had been artificially dug. This construction must have postdated the development of the hybrid.

H4. *Cyperus dives* Delile (No. 12) (= *C. immensus* C.B. Clarke) × *Mariscus solidus* (Kunth) Vorster (No. 17)

C.J. Ward 10980, collected 22-10-1990, south coast, Hibberdene, Mhlungwa River.

On the floodplain of the river grew large, well-established clumps of *Mariscus solidus* with the grass *Stenotaphrum secundatum* (Watt) Kuntze as ground cover. At a lower level, along a previous course taken by the river (still detectable) grew other sedges including *Eleocharis limosa* (Schrad.) Schult., and *Cyperus dives*.

The putative hybrid (resembling *M. solidus* in general facies, but slightly more robust and with leaves and inflorescence bracts resembling *C. dives* in colour and texture), grew in a localised stand, the plants being associated so as to suggest a clonal origin by vegetative multiplication from a single progenitor.

H5. *Cyperus papyrus* L. × *C.* ?

C. elephantinus C.B. Clarke (No. 13) is based on *Buchanan 113, 320* (probably only one gathering). Only inflorescence(s?) are known. Their large size, together with the bracts of the secondary anthelas, suggest relationship with *C. papyrus*, which species is known to undergo interspecific hybridisation (see H2.). No similar specimens are known. The locality of collection was not specified by Buchanan. Kükenthal (1936) placed the species in Sect. *Papyrus* (Willd.) C.B. Clarke and Vorster (1978a) grew and examined anatomically, a comparable but not identical hybrid from the Transvaal (*Scheepers 1250*) to find there was similarity with *C. papyrus*.

H6. *Cyperus prolifer* Lam. (No. 29) × *C. sensilis* Baijnath (No. 38)

C. × *turbatus* Baijnath: 345 (1973); Baijnath: 372 (1976).

Plants are morphologically intermediate between the two parents. This is most easily seen in the inflorescence (rays 100–250, at maturity some reflexed to lie close to the culm in *C. prolifer*; rays 25–60, not reflexed in *C. sensilis*; 40–75 and not reflexed in *C.* × *turbatus*). The flowering period of the hybrid is common to both parents. Epidermal papillae may be developed in both parents, but have not been observed for the hybrid. Vegetative multiplication from the inflorescence is frequent in *C. prolifer* (latent buds in the axils of the bracts become active); in *C. sensilis* vegetative multiplication involving the inflorescence is unknown (lateral buds are degenerate). Hybrid plants have active lateral buds and so are capable of vegetative multiplication from the inflorescence, but this is less well developed than in *C. prolifer*. Distribution of the hybrid is confined to areas where both parents are known. Edaphic disturbance such as impeded drainage or soil dumping has taken place in localities where the hybrids exist. Man, by road-building activities, is likely to have been responsible for some of the habitat disturbance. Chromosomes: *C. prolifer* 2n = 16; *C. sensilis* 2n = 12; *C.* × *turbatus* 2n = 14.

H7. *Fimbristylis dichotoma* (L.) Vahl (No. 4) × *F. ferruginea* (L.) Vahl (No. 6)

The discovery by C.J. Ward in 1988, in the Palm Beach area of the Natal south coast, of a population of plants (Voucher: *Ward 10183*) agreeing closely with the Drège type of *F. dregeana* (No. 5) has been recorded under that species.

Ward 10183 included plants 100–190 mm in height, tufted, leafy, bearing head-like inflorescences of 2–6 spikelets resembling those of *F. ferruginea* in size, but with the glabrous glumes of *F. dichotoma*. The achenes, which carry tubercles (etuberculate in both parents) have the approximate shape and size of those of *F. ferruginea*, but the surface is trabeculate, the number of longitudinal ridges being more than in achenes of *F. dichotoma*, the cells narrower in transverse width (Figure 34I, L).

F. dregeana is probably a stabilized species of hybrid origin from the putative parents named. The robustness and short stature of the Ward population and of Drège's type may possibly be the outcome of environmental conditions.

Other putative sporadic hybrids between *F. dichotoma* and *F. ferruginea* are frequent along the Natal coast. Each individual collection differs slightly, but the relationship to the parental species is clear. In all, achenes are tuberculate. These include:

H7a. *Mogg 4312* (PRE) from Mtunzini;
H7b. *Wells 98, 99* from Gledhow Mission, near Phoenix (recorded by the collector as growing among plants of both putative parents);
H7c. *Ward 1825* from Hluhluwe. In this specimen glumes were pubescent abaxially in the distal half (as for *F. ferruginea*); achenes were smooth-surfaced, but the epidermal cells had the shape of those of *F. dichotoma*;
H7d. *I'Ons 30/81, 38/81* from the Oribi Gorge area.

Where relationship to either parent is close, specimens are usually accepted as falling within the limits of parental variation, but the presence of tuberculate achenes should alert observers to examine critically the possibility that gene exchange has taken place. As far as is known there is no evidence of the presence of hybrid swarms.

H8. *Isolepis costata* Hochst. ex A. Rich. (No. 3) × *Scirpus ficinioides* Kunth (No. 3)

Burtt (1986) established *I. pellocolea* (No. 7) on a type collected in the Natal Uplands. The author drew attention to the similarity between plants of his species and those of the sympatric *I. costata*, but pointed out that the achene sculpturing in the two taxa was quite different (ribbed and trabeculate in *I. costata*; more or less smooth in *I. pellocolea*). In consequence he looked for affinity with other *Isolepis* species, naming *I. prolifera* (Rottb.) R. Br. as the most probable. However, *I. prolifera* is not known from the Uplands.

Also sympatric with *I. costata* and *I. pellocolea* was *Scirpus ficinioides*. The precise affinity of the last taxon has not been established. The long over-topping bract of the inflorescence and the presence of hypogynous bristles suggest relationship with *Schoenoplectus* (Rchb.) Palla, but the achene sculpturing is closer to that of a number of *Isolepis* species, rather than with the achene surfaces represented in *Schoenoplectus*.

Study of *I. costata*, *I. pellocolea* and *Scirpus ficinioides*, in the field [Browning (pers. comm. 1990) reported the three species as growing in close proximity to one another in the vlei area in front of King's Lodge, Sehlabathebe, Lesotho], and in the herbarium, suggest a possible hybrid origin for *I. pellocolea*, by way of gene exchange (and probable stabilisation?) from the putative parents named.

Intermediate characters exhibited by *I. pellocolea* have been summarised by Burtt (1986) and in the present work (see p. 109).

H9. *Schoenoplectus corymbosus* (Roth ex Roem. & Schult.) J. Raynal var. *brachyceras* (A. Rich.) Lye (No. 3.2) × *S. paludicola* (Kunth) Palla ex J. Raynal (No. 10)

P.B. Taylor 125, from Kokstad, Mount Currie, collected along a drainage line in an area approximately 50 × 50 m, comprised three tufts designated A, B, and C. The last two were typical *S. paludicola*. A was a robust plant with the facies of *S. corymbosus* var. *brachyceras*. Dissection and measurement of essential organs revealed a number of characters of this last species, namely, no hypogynous bristles accompanying the florets; the filaments not early deciduous, but persistent; glumes with a rather elongate apex and the overall length of *S. corymbosus*. The anthers were similar in form to those of *S. paludicola* and were intermediate in length between those of the two putative parents. Style branches were longer than those of typical *S. paludicola*. All achenes of tuft A, the putative hybrid, were white, shrivelled and infertile. *Taylor 85* is typical *S. corymbosus* var. *brachyceras* from the same locality.

Notes referring to genera

Bulbostylis Kunth ex C.B. Clarke

Within this genus relationships are close and the general facies, especially of the grassland species, is similar. In consequence, individual interspecific hybrids are not readily recognised. However gene exchange between species seems to occur as is evinced by intermediates that are not readily identifiable. There are also represented 'species' (?) that show an unusually wide range of variability. Worthy of particular study are *B. contexta* (Nees) Bodard; *B. oritrephes* (Ridl.) C.B. Clarke and *B. hispidula* (Vahl) R.W. Haines.

Mariscus Vahl

Within *Mariscus* are a number of taxa in which abnormal development of the spikelets takes place (*M. rehmannianus* C.B. Clarke, *M. macrocarpus* Kunth, *M. grantii* C.B. Clarke, *M. dubius* (Rottb.) Kük. ex C.E.C. Fisch.). Whether these aberrations lead to vegetative multiplication from the inflorescence needs further investigation. They are, however, suggestive of some genetic imbalance possibly arising from interspecific hybridisation.

There is also some evidence of taxa in which the floret number within a spikelet is not constant.

In other cases, species limits are difficult to establish. The *M. dubius* (Rottb.) Kük. ex C.E.C. Fisch., *M. dregeanus* Kunth, *M. capensis* (Steud.) Schrad. complex is one such example. All these instances are worthy of study in relation to possible hybridisation.

Pycreus P. Beauv.

It is not unusual for several species of *Pycreus* to occur sympatrically within the limits of a vlei. Hybridisation may be the phenomenon responsible for some of the individuals encountered that do not 'fit' satisfactorily with already known taxa.

Addendum

Bolboschoenus maritimus (p. 25): study of pericarp anatomy has revealed that Natal plants under this name represent a distinct entity that has been long confused with the species named (Browning & Gordon-Gray 1992, 1993).

Bulbostylis arenaria (p. 29): Natal plants are not this species. They must be known as *B. humilis* (Kunth) C.B. Clarke. Efforts to trace *B. arenaria* (Nees) Kük. [Feddes Repertorium 40: 1–416 (1938)] were unsuccessful. Prof. E.R. Guaglianone, Instituto de Botanica Darwinion, San Isidro, Argentina, to whom I am indebted, provided the following information: *B. arenaria* (Nees) Lindm. [Bihang till K. Svenska vetenskapsakademiens handlingar 2b Afd. 3, No. 9: 19 (1900)] is *B. juncoides* (Vahl) Kük. [Osten. Anales del Museo de historia natural de Montevideo II3: 187 (1931)] see Král (1971) and Svenson, H.K. (1957) *North American Flora* 18,9: 505–556 (with 1 plate). *B. juncoides* is unknown from Africa and quite distinct from Natal plants.

Carex, type species (p. 36): Wilson & Goetghebeur (1989) stated '*non designatus*'; Tucker (1987) accepted *C. hirta* L.; Koyama (1985) listed *C. acuta* L., as did Goetghebeur (1986), who attributed this species as lectotype to Mackenzie (1931: 10). There is now a proposal to conserve *Carex* with *C. hirta* as the type, but this must be ratified (A. Reznicek pers. comm.).

Carex austro-africana (No. 2) (p. 37): type unknown; Schönland (1922) lists under *C. cernua* Boott var. *austro-africana* Kük., specimens that may be syntypes.

Carex subinflata (No. 8) (p. 43): = *C. clavata* auctt. non Thunb. (1794) C.B. Clarke: 681 (1894b); C.B. Clarke: 309 (1897/98); Kük.: 736 (1909) p.p.

Carpha filifolia (p. 43): bristles have upward pointing barbs and are never plumose.

Cyperus dives (No. 12) (p. 56) *C. latifolius* (No. 21) (p. 61): the former is adaptable to changing water levels and some disturbance of the microhabitat; the latter is usually found in stable habitats, rooted in permanent, oxygenated water.

Cyperus fastigiatus (No. 16) (p. 58): Natal plants are variable and in need of further study (underground organs in particular). Rhizomes vary from slender, elongate, almost naked, to robust, contracted, densely clothed in large, reddish brown to blackish scale leaves. Not all plants produce fruit in quantity. In Maputaland, intermediacy between *C. fastigiatus* and *C. papyrus* is prevalent (Vouchers: *C.J. Ward 28, 7309*; *Ward & Begg 11380*; *Ward & Rajh 11436*). Field study is needed to determine if hybrid swarms, introgressed populations, both, or neither, may be detected. The type is uncertain from Cape Province, not *Sieber*, Flora mixta *n. 218* (Mauritius) (LD) which is *Pycreus macrostachyos* (Lam.) J. Raynal.

Cyperus halpan L. (p. 56) (*haspan*) (p. 75): K.L. Wilson (1994: 598) has established that the correct name is *C. haspan.*

Mariscus cyperoides (Roxb.) A. Dietr. subsp. *africanus* (C.B. Clarke ex Kük.) Podlech (p. 129): since writing the text, it has come to my notice that the correct genus for the above taxon is *Courtoisina* Sojak (1979). Combinations for the Natal species and its tropical African relative are:

Courtoisina cyperoides *(Roxb.) Sojak* = [*M. cyperoides*].

C. assimilis (Steud.) P. Macquet = [*M. assimilis* (Steud.)] Podlech [see Wilson (1983)].

Mariscus grantii C.B. Clarke (pp. 131, 134): plants of this species (aggressive weeds) have been introduced into suburban parks and gardens in Sydney and Perth. Wilson (1994) has transferred the taxon to *Cyperus* as *Cyperus vorsteri* K.L. Wilson nom. nov.

Macrochaetium (p. 187): *Cyathocoma* Nees (1834) has priority over *Macrochaetium* Steud. (1855) [Goetghebeur: 778, 779 (1986)].

Schoenoplectus confusus (No. 2) (p. 154): for more information on Natal plants of this species consult Browning (1991a).

Schoenoplectus corymbosus var. *brachyceras* (No. 3) (p. 156): Browning (1992b) reverted this variety to specific status.

Schoenoplectus litoralis (No. 7) (p. 158): for more information on Natal plants, consult Browning *et al.* (1994).

Tetraria natalensis (No. 3) (p. 190): information is accumulating that *Costularia* and *Cyathocoma* = [*Macrochaetium*] are far more closely related to one another than either is to *Tetraria* (Browning & Gordon-Gray in prep.)

Tetraria sp. A (p. 192): *Moll 4789* is probably *Tetraria bachmannii* Kük. = [*T. thuarii* P. Beauv. var. *gracilior* C.B. Clarke]. For this information I am indebted to C. Archer PRE, who examined the syntypes (*Bachmann 66, 67*).

Tetraria sp. B (p. 193): *Killick 1596*. The relationship of this plant is with *Epischoenus* C.B. Clarke and *Schoenus* L. rather than with *Tetraria* (Browning & Gordon-Gray in prep.)

Index to scientific names and synonyms

Scientific names for Natal taxa are printed in **bold** type. Synonyms are printed in *italic* type. Other names are in mild Roman type. Page numbers in bold indicate figures of species.

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